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Third Quarter, 1992

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PRODUCT
DEVELOPMENT

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PROGRAM NUMBER : 920101-01
PROGRAM NAME : Product Development
PROGRAM COORDINATOR: R. P. Heretick/C. B. Altizer
WRITTEN BY : C. B. Altizer and J. L. Spruill
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary: Domestic Product Development programs to date are in line with commitments made for 1992. The B&H K.S. line extensions have been launched. Marlboro Extra and Marlboro Express programs are on schedule to meet the deadlines for consumer research and ad packs. Product for the Virginia Slims 100's low sidestream research was completed and testing is in progress.

I. Objective: B&H King Size Line Extension

Design and develop a B&H King Size Menthol and Regular, Full Flavor and Lights.

A. Strategy V: Launch

1. **Results:** Northeast urban market pre-launch was executed 8/3/92 with promotional product (\$.40 off) in New York, Philadelphia, Baltimore, Washington, D.C., and Boston, to contest the increased activity of our key competitors during the summer months. Also there exists the opportunity to force Newport to aggressively defend its highest franchise areas.

National launch with promotional materials is scheduled for 9/7/92, followed by Region 5.

2. **Plans:** A sampling plan to insure subjective integrity was instituted. Samples of product will be monitored weekly by Product Development and Flavor Technology, if warranted.

II. Objective: Parliament Menthol Lights

- A. Strategy III:** Modify current design and develop prototypes for 11mg tar product acceptable to full flavor menthol smokers.

1. **Results:** Prototypes were designed and a factory trial was completed July, 1992.
2. **Plans:** Final specifications will be drafted in September. Product will then be a shelf item pending launch plans.

III. Objective: Merit Ultima

Support Merit Ultima Launch

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A. Strategy II: Consumer Research

1. **Results:** Four products were requested and released for RGA testing: Now KS, Carlton KS, Merit Ultima KS and Merit Ultima KS white tipped (made in Cabarrus 6/30).
2. **Plans:** No further activity forecasted.

B. Strategy III: Design and develop KS/100 menthol line extensions.

1. **Results:** Prototypes are scheduled for manufacture the week of 8/31 for King Size and 9/7 for 100mm. These models will be used for analytical and subjective confirmation of the original models made in 4th quarter, 1990. Both models incorporate 100% synthetic menthol, an alcohol reduced aftercut and are mentholated via foil and filler.
2. **Plans:** Schedule monadic testing late 4th quarter/early 1st quarter 1993. Complete specifications and factory trial 1st quarter 1993 with National Introduction 2nd quarter 1993.

C. Strategy IV: Design and develop 120mm line extension (regular/menthol)

1. **Results:** Three 23.0 x 119.5mm prototypes are scheduled for lab max manufacture the week of 9/7, incorporating three blends: Merit Ultima (50% JET), #298 (38% JET) and Merit Ultra Lights. All models are targeted at 5mg tar and use a CA filter. Equipment issues will need to be addressed if the 120mm product is assigned a 24.0 or 24.8 circumference. A one year lead time has been stated to provide maker/packer equipment for these two circumferences. Additionally, Filtrona will require a minimum of 12 weeks lead time if the DPCC filter is used for the 120mm product line extension.
2. **Plans:** Complete prototype evaluations and refinements by 4th quarter. Write cigarette specifications and complete factory trials during 1st quarter, 1993 with National Introduction 2nd quarter 1993.

IV. Objective: 3 mg Merit

Design and develop a 3 mg product with the subjective attributes of a 6 mg cigarette.

A. Strategy I: Design and develop initial prototypes using conventional materials.

1. **Results:** Complete

B. Strategy II: Design and develop prototypes using new and/or novel components.

1. **Results:** Additional prototypes have been requested evaluating CA PM Web and Tela web for blends #298 and #387. The Tela and web filters will use two

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ventilation targets to optimize the TRTD and tar targets as compared to the CA filter controls for the prototypes.

2. **Plans:** Evaluate prototypes analytically and subjectively for prototype selection for POL testing.

C. **Strategy III:** Evaluate Prototypes

1. **Results:** Two POL tests have closed: 02082 (repositioning MUL from 5mg to 6mg) and 02080 (3mg/CA Filter). Both tests demonstrated favorable results. The 3mg model incorporated NET technology (38% inclusion), reduced alcohol and humectant levels in the flavor system and the improved solubility aftercut. Incorporation of these attributes gives the tobacco character which is lacking in most low delivery cigarettes and provided test results showing a 3mg tar product higher in strength ratings than a 6mg tar product with equal liking when compared to a 5-6mg tar product.

POL 02081 (3mg/PM Web Filter) was rejected for low tar delivery. Additional prototypes are being made to ensure correct physical parameters for testing. POL 02088 (3mg/CA Filter) was completed for analytical/subjective evaluations. This product incorporates blend #298 (38% JET) and provide a back-up position if the NET product is unavailable in production quantities.

2. **Plans:** Evaluate prototypes for selecting product for POL 02081 (3mg/PM Web Filter). Release POL for shipment in November. Evaluate POL 02088 (3mg/CA Filter) for shipment in September.

D. **Strategy IV:** Net Inclusion

1. **Results:** Additional NET blend formulas have been requested to provide the best opportunity for utilizing NET technology, i.e. partial expansion, total blend expansion, lower temperatures.
2. **Plans:** Request and evaluate 3mg prototypes incorporating NET materials.
3. **Contributors:** B. Monahan, S. Skalak

V. **Objective:** 6 mg Merit

Design and develop a 6 mg product with the subjective attributes of an 8 mg cigarette.

A. **Strategy I:** Design and develop initial prototypes using conventional materials.

1. **Results:** Six blends were evaluated using a CA filter. The blend selected was Marlboro Ultra Lights.

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2. Plans: No further work forecasted.

B. Strategy II: Design and develop prototypes using new and/or novel components.

1. Results: Nine NET component blends were evaluated using a CA filter. Two blends were selected (#436 & 437) for flavor evaluations. Blend #436 (#14 Bright) showed the most promise. However, the Marlboro Ultra Lights blend was more flavorful subjectively than blend #436.
2. Plans: Evaluate additional NET component blends as received.

C. Strategy III: Evaluate prototypes

1. Results: POL 02083 (Repositioning Merit from 8mg to 9mg) was released for testing. Two prototypes have been requested using Marlboro Ultra Lights blend, Merit Ultima Bright casing, CA filter and two aftercuts: Marlboro Ultra Lights and the new 3mg aftercut (9081-48).
2. Plans: Evaluate new 6mg prototypes to select prototype for possible 4th quarter POL testing.

VI. Objective: Virginia Slims King Size

Design and develop King Size Menthol and Non-menthol line extensions.

- A. Strategy I: Develop and design prototypes at 24.0 x 83mm length products using conventional cigarette paper.**
1. Results: Two 11mg tar POL tests were released for shipment: 02077/c-w tipping and 02078/ white tipping. Each test had a 1.3 tar/puff. Designs have been completed and requests have been submitted for the following prototypes: 83mm length by 23.0 and 24.0 circ. at 13mg tar (1.4 tar/puff) and 83mm length x 23.0 circ. at 11mg tar (1.3 tar/puff). POL tests will be scheduled based on the analytical/subjective results from the models with a potential Ad Pack forecasted for late 4th quarter.
 2. Plans: Complete and evaluate models for POL testing.

VII. Objective: Virginia Slims 100's

Design and develop 100mm line extensions incorporating social benefits; reduced visible sidestream, pleasant sidestream aroma, low/neutral sidestream aroma or combinations thereof.

- A. Strategy IV: Consumer Research Testing**

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1. **Results:** 100mm Slims products were requested and approved for POL, Extended Study, Focus Group and one-on-one consumer research. Regular and menthol models, including controls were completed incorporating added aroma (Aromatek 150), low/neutral aroma (CR2978) and low sidestream cigarette paper by itself and in combination with Aromatek 150 and CR2978. All low sidestream models gave 50% + sidestream visibility reductions. Twelve POL tests have been shipped. Samples, regular and menthol, using low sidestream paper coated with Aromatek 150 and CR2978 are currently being evaluated in Focus Group and one-on-one research. The extended study products will be tested after the results are obtained from Focus Group and one-on-one research.

Extended smoking, Focus Groups and one-on-one research was also requested using King Size models (24.8 x 84mm length) incorporating technologies to address social benefits (reduced sidestream visibility, pleasant added aroma and a low/neutral aroma). Six models were completed (including control) and approved for testing. As in the case of the 100mm products, the low sidestream model using Aromatek 150 and CR2978 were provided for Focus Group and one-on-one research. Release of product for the extended study will be dependent on the results from the Focus Group and one-on-one research.

2. **Plans:** Review results of consumer testing and based on research evaluations, proceed with specifications and factory trials.

VIII. Objective: Marlboro/Marlboro Lights

Design and implement blend modification studies for the Marlboro Family of products which incorporate increases in expanded tobacco content and support the goal of a 15% BLDET inclusion level by 1995.

- A. **Strategy II:** Design and develop prototypes incorporating component reformulations which include higher expanded tobacco levels.

1. **Results:** Prototype blend revisions for the Marlboro have been made which incorporated 13% DETA-XTL, and 13% BLDET-T2. The revised Marlboro blend is to be subjectively acceptable with 13% BLDET inclusion, and later evaluated and subjectively approved with 15% BLDET.

Four POLs were made at Stockton Street during the period which evaluated a 100% Flue-cured ET blend (DETA-XTL) and a BLDET-2 at 13% inclusion levels. The results of the first pair of POLs were inconclusive. Close-out on the second pair of POLs is early September.

2. **Plans:** Review results from the four POLs and determine if additional evaluations are required, and repeat POLs by manufacturing them in Cabarrus and the Manufacturing Center.
3. **Contributors:** D. Rockwell (Cigarette Technology), R. Keatts (Leaf Department)

IX. Objective: Marlboro Wides

Develop KS 80/83 mm full flavor/lights products at an increased circumference.

A. Strategy I: Design/produce product at different circumferences/lengths utilizing existing blends.

1. **Results:** Products, full flavor and lights, have been supplied for focus group research during 3rd quarter (80/83mm length/26.5/27.0mm circ.). Final dimensions for the product have been specified: 26.5 x 83mm length.
2. **Plans:** Provide product, as required, for focus group research.

B. Strategy II: Address issues necessary to accommodate R&D and production concerns.

1. **Results:** Cigarette making equipment is scheduled for installation in Semiworks mid October. Cigarette parameters (CPI, firmness, filter OV, etc.) will be addressed at this time for manageable transition into production.
2. **Plans:** Address any product or manufacturing issues and prepare factory specifications.

C. Strategy IV: Consumer Research

1. **Results:** During the third quarter a consumer research plan was implemented. Full Flavor and Lights products were supplied for an Advertising Test in mid August with a "single stick" concept product consumer research scheduled for field work 9/25. Full Flavor and Lights products are being produced on the Lab Max in Semiworks for this testing. Appropriate analytical and subjective evaluations will be completed.
2. **Plans:** Provide products for Ad Pack.

X. Objective: All Lamina Blend

Design and develop product(s) which provide the full, rich smooth tobacco taste of all lamina blends.

A. Strategy I: Design and develop prototypes.

1. **Results:** Complete

B. Strategy II: Redesign prototypes

1. **Results:** Prototypes were made using Blend 378-E (30% BLDET). The models completed compared standard Marlboro casings/aftercuts with an alcohol-free

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burley top and with a 30% reduced alcohol aftercut. Subjectively, the models were found to be similar.

2. **Plans:** No further work planned.

C. **Strategy III:** Spotting and staining study

1. **Results:** Control and alcohol reduced/free models were submitted for spotting evaluations by Quality Engineering.
2. **Plans:** Complete spotting studies.

XI. **Objective:** Red Express

Develop a full flavor and lights line extensions sensorially similar to the current Marlboro Red and Lights products.

A. **Strategy I:** Develop and Design Prototypes

1. **Results:** Prototypes have been completed and supplied for focus group research in full flavor and lights. Final dimensions for the line extension have been specified: 24.8 x 72mm length.
2. **Plans:** Provide product, as required, for Focus Group research.

B. **Strategy IV:** Ad Pack and price testing

1. **Results:** A joint research plan has been implemented with Marketing. Full flavor and lights identified product were supplied for advertising tests in mid August. A pricing test and Ad Pack have been scheduled for the "Roof" and "Solid" packs. "Roof" product (170 cartons FF/130 cartons lights) was supplied for the RX Pricing Test which begins 9/8. Semiworks production is continuing for the 360 cartons each of full flavor/lights required for the RX Ad Pack scheduled for 10/2. "Solid" Pack production will begin, as soon as packaging is approved, for the Pricing test (ship 9/22) and Ad Pack (field work 10/16) required using this packaging.
2. **Plans:** Continue cigarette production for Pricing Test and Ad Pack.

C. **Strategy V:** Machinery Development

1. **Results:** Change parts were received installation and changeover completed and tune/testing completed on existing equipment for production of the Pricing Test and Ad Pack. Maker/Packer for the 24.8 x 72mm length product is currently installed in Semiworks.

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2. **Plans:** No further work is projected.

XII. Objective: Alpine

To determine what modifications, if any, are necessary to enhance the performance of the product in the marketplace.

A. Strategy I: Consumer Testing

1. **Results:** Testing of the fourth POL (06001 - 100's full flavor) was completed.
2. **Plans:** Review the completed POL testing and modify/improve current products as directed by POL results.

XIII. Objective: Slims 100's

Design and develop a generic 100mm with 23.0 circumference to compete with Misty.

A. Strategy II: Refine designs; fabricate new prototypes.

1. **Results:** Blend analysis was completed for Style and Misty products. Prototypes will be requested for lights/full flavor regular/menthol products incorporating Brica blend.
2. **Plans:** Produce/evaluate prototypes for shelf items.

XIV. Objective: Seville

Develop a free standing sub-generic menthol product in KS, 100 SP, and FTB with sensory character similar to Kool.

A. Strategy II: Baseline Prototypes

1. **Results:** Based on previous POL testing, MB4B blend is the candidate for this program (B&H KS FF/Lights with option to adjust menthol level). Additional prototypes were completed as alternate possibilities as well as; MB4B and Brica blends with different aftercuts. Additional requests have been submitted for MB4B 100mm SP product refinements.
2. **Plans:** Complete work in progress and write specifications. Product is a "shelf item" until launch plans are firm.

XV. Objective: Bucks Line Extensions

Design and develop line extensions for Bucks.

- A. **Strategy I:** Develop and design a 70mm non-filter, 100's soft pack, and 100's Lights soft pack using the Bucks modified AC and the Brica blend to deliver similar response as that of the KS product.

1. **Results:** Prototypes were designed and requests were submitted to Semiworks on August 25, 1992.
2. **Plans:** Earlier prototypes of the 83 and 100mm with the Bucks AC were evaluated and approved by the Richmond Panel. Preliminary specifications are complete.
3. **Contributors:** V. Peace (Cigarette Technology), H. Maxwell (Flavor Technology)

XVI. Objective: Consumer Testing

Generate a database of strength and liking scores for PM and competitor's products to identify new product opportunities and product/process improvements.

- A. **Strategy I:** Routine Testing of Philip Morris and Competitor's Product

1. **Results:**

Number of tests completed	13
Number of tests in progress	11
Number of tests projected for 4th quarter	19

2. **Plans:** Initiate and complete projected 4th quarter testing.

- B. **Strategy II:** Supply Product For Non-Standard POL's

1. **Results:**

Number of tests completed	1
Number of tests in progress	0
Number of tests projected for 4th quarter	4

2. **Plans:** Complete 4th quarter testing.

- C. **Strategy III:** POL's For New Product Development

1. **Results:**

Number of tests completed	25
Number of tests in progress	1
Number of tests projected for 4th quarter	3

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2. Plans: Complete 4th quarter testing.

D. Strategy IV: POL's For Product/Process Improvement Programs

1. Results:

Number of tests completed	10
Number of tests in progress	1
Number of tests projected for 4th quarter	7

2. Plans: Complete 4th quarter testing.

XVII. Objective: Marketing Program Support

To support Marketing and Marketing Research efforts in the areas of focus groups, ad packs and packaging concept tests to provide cigarette prototypes, special packings and product information necessary to assess feasibility of concepts.

A. Strategy I: Provide Product As Requested

1. Results: Product has been supplied for focus groups, packaging comps and visual samples for the following programs:

Marlboro Wides
Marlboro Red Express
120mm Line Extension
Virginia Slims King Size

2. Plans: Provide product, as required.

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PRODUCT
TECHNOLOGY

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PROGRAM NUMBER : 920101-02
PROGRAM NAME : Product Technology
PROGRAM COORDINATOR : R. P. Heretick/C. B. Altizer
WRITTEN BY : C. B. Altizer and J. L. Spruill
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary: Low tar/high flavor effort continues to be focused on the Merit Family with the development of 1mg Merit Ultima Menthol and the Merit 3 and 6mg products. Ambrosia I and Ambrosia II technologies were utilized in the Virginia Slims low sidestream consumer testing program. Program for 70% reduced sidestream visibility is in progress. The Computer Applications program continues on schedule. A presentation outlining the scope of systems integration has been made. Management has given approval to proceed.

I. Objective: Project Ambrosia I

Develop cigarette prototypes which exhibit a vanillin-like sidestream aroma.

A. **Strategy III:** To develop a modified polysaccharide incorporating a covalently bound flavorant for incorporation into the wet end of the papermaking process so the flavorant will be thermally released when a cigarette is smoked.

1. **Results and Conclusions:** Aqualon reported that their attempts to produce a vanillin ester of pectin did not succeed in incorporation of any flavorant. Attempts to try the chloroformate route to produce a carbonate derivative of cellulose were also unsuccessful.

Samples were received of a vanillin glycidyl ether of cellulose using either cotton linters or flax. Analyses by solid-state NMR indicated incorporation of vanillin at about 0.2 degree of substitution. These materials exhibited good handsheet papermaking characteristics. Sidestream from statically burning handmade cigarettes gave a pleasant aroma.

2. **Plans:** An additional small-scale sample which is solvent-free and contains no free vanillin has been requested. It will be assessed for phase clearance to allow mainstream subjective evaluation of handmade cigarettes. If testing warrants, pilot scale production of material will be pursued for preparation of machine-made paper.

3. **Contributors:** S. Tafur (Paper Technology), G. Chan, Y. Houminer (Chemical Research)

II. Objective: Project Ambrosia II

Develop a flavor agent for use in a cigarette designed to deliver a more acceptable sidestream with a non-distinct aroma (Ambrosia).

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A. **Strategy I:** To develop a commercial method for the production of CR-2978, a release agent for HCA, and supply 10 lbs. of material.

1. **Results:** Extensive trials were conducted to establish the conditions, stoichiometry, and reagents for the synthesis of CR-2978. This process uses reagents and conditions which are suitable for larger scale production of CR-2978. The synthesis gives an overall yield >75%. Large quantities of CR-2978 (2 lbs. and 10 lbs.) were produced in the CRD and delivered to FT for evaluation.
2. **Plans:** Optimize the commercial method.
3. **Conclusions:** CR-2978 has been shown to release α -HCA. It has been prepared in large quantities and is available for further studies.
4. **Contributors:** Chemical Research

B. **Strategy II:** To find a producer for CR-2978 and to manufacture 25 pounds of this material.

1. **Results:** Aldrich conducted two 5 liter trial runs and developed an alternate procedure for precipitation and isolation of HexylC. Three 50-liter reactions were run and produced a total of 25 pounds of HexylC in an average yield of 75%. This material met all of our analytical specifications and was found to be subjectively similar to a control sample by Flavor Technology. The product was accepted and received by Philip Morris.
2. **Plans:** Conduct additional experimental trials as required in order to be able to produce this material on a 1,000 to 2,000 scale, if needed.
3. **Conclusions:** CR2978 can be reproducibly manufactured on a 50 liter scale.
4. **Contributors:** Chemical Research

C. **Strategy III:** Chemical research

1. **Results:** A large number of samples for Project Ambrosia were smoked on the 5-port prototype CORESTA smoking machine to determine the delivery of HCA to mainstream and sidestream smoke from cigarettes made with CR-2978 treated papers. A second operator for the 5-port was trained to handle the extra load.

Twenty runs with IM13 cigarettes were made on the 8-port prototype CORESTA smoking machine. The MS TPM, SS TPM and puff count data from the 8-port were compared to the long term results for the 5-port prototype CORESTA smoking machine. In addition, cigarettes treated to release HCA were smoked on both machines so that the HCA deliveries to MS and SS could be compared. A memo detailing the results of these runs and recommending the

use of the 8-port machine was written. The 5-port machine has been retired and all future work will be performed on the 8-port machine.

Chamber runs were made on the experimental cigarettes X6D2BNF and X6D2BNH. X6D2BNH has the sidestream odor modification compound CR-2978 added to the paper. X6D2BNF is the control cigarette. The objective of this work is to determine if CR-2978 masks the smell of odor-causing compounds or actually causes a reduction in their concentration. Full chamber analyticals were recorded and headspace gc/ms samples were collected.

Headspace gc/ms samples from the sidestream chamber for the samples X6D2BNF and X6D2BNH are being analyzed. The results from 33 chromatograms have been transferred to CAD personnel for statistical analysis. Total peak areas for the experimental model (BNH) are 10 to 30% greater than for the control (BNF). More than 100 individual compounds are present in larger amounts (peaks) in the experimental model at a confidence level of 90% or better. Only three peaks were found where a compound was present in larger amounts in the control.

Previous work with the headspace gc/ms showed that HCA could be readily chromatographed. However, this method could not be used to measure the concentration of HCA in the chamber because of the low volatility of HCA. In the course of this work, non-standard absorbents and analytical techniques were explored. The results also indicated that the current method for sidestream gas phase analysis was near optimum.

The large number of samples were analyzed by pyrolysis gc/ms for the development of an HCA release agent. These samples included various papers coated with different levels of CR-2977 and CR-2978.

A sample of Aqualon AQ0514-24, a modified wood pulp designed to release vanillin, was analyzed by pyrolysis gc/ms at 200, 300, 400, and 500 C. A sample of Aqualon aq0514-49, a modified flax pulp designed to release vanillin, was submitted for analysis by pyrolysis gc/ms. The sample is being run and the results will be issued soon.

2. **Plans:** Smoking runs in the sidestream chamber and on the 8-port prototype CORESTA smoking machine will be run as requested in support of Project Ambrosia. Statistical analysis of the sidestream gas phase samples will be completed. Pyrolysis gs/ms analysis of flavor release agents will continue.
3. **Contributors:** Chemical Research
4. **References:** CKY Tatum, "Sidestream Smoking Chamber Results: Release Agent CR-2978 Test Series," Memo to D. D. McRae, July 15, 1992.

D. Douglas, "Sidestream Irritation: V. HCA Analysis," Memo to. Comes, May 13, 1992.

J. Naworal, "Pyrolysis GC/MS Analysis at 300 C of P2HK Paper Coated with Different Levels of CR-2978," Memo to R. Comes, May 12, 1992.

J. Naworal, "Pyrolysis GC/MS Analysis at 300 C of P2GS Paper Coated with 1% Solution of CR-2978," Memo to R. Comes, May 14, 1992.

J. Naworal, "Pyrolysis GC/MS Analysis at 300 C of PORQ Paper Coated with 1% Solution of CR-2977," Memo to R. Comes, May 14, 1992.

J. Naworal, "Pyrolysis GC/MS Analysis of Aqualon AQ0514-24 (Vanillin Release Agent)," Memo to G. Chan, August 5, 1992.

III. Objective: Consumer Research Technology

To collect and interpret information on consumer attitudes, lifestyles, behavior, and concept/product perceptions to determine potential R&D and PM-USA product programs and provide direction for existing programs. (Strategic Goals 1-5)

A. **Strategy I:** Evaluate alternative research procedures, propose and conduct pilot research followed by quantitative testing to combine consumer's concepts/features.

1. **Results:** Key questions to quantify consumers' behavior, attitudes, and lifestyles, derived from the Consumer Needs Research and from Marketing Research surveys, have been incorporated into a quantitative questionnaire to be fielded by Marketing Research (third quarter).
2. **Plans:** From the Marketing Research survey, obtain those items which are key discriminating variables. Determine how these variables can be used to segment the market, and how these segments differ from current demographic variables. Assess the usefulness of this instrument to screen or group consumers for concept/product evaluation research.
3. **Contributors:** Jan Jones (Product Evaluation Division), Page Callahan (Product Evaluation Division), James Gear (Product Evaluation Division), John Tindall (Product Evaluation Division), New York Marketing Research

B. **Strategy II:** Design and critique methods for consumer evaluation of multiple concepts/prototypes within benefit themes, including social acceptability, and product attributes to communicate quality and value.

1. **Results:** NY and Richmond are collaborating to establish stimulus sets for concept/prototype testing among specific smoker segments and brand groups.

Triads and one-on-one interviews were conducted with 52 smokers in Cincinnati and New Jersey to evaluate the aluminum pack. Consumers, particularly box smokers, gave very positive reactions; the aluminum pack was rated highest of seven packs tested (box, soft pack, Wraps, rounded, and plastic). Benefits were: functionality, contemporary, higher quality/value, recyclable, freshness. Issues

noted were: recyclable requirement (N.J.), does not incorporate soft pack benefits. Generally, box smokers considered this to have all the benefits of a box plus more.

A research plan has been designed to assess low smoke/low odor products, involving product placement and follow-up interviews among consumers. POLs are underway to evaluate product and unaided consumer awareness of benefits. Focus groups and one-on-one interviews begin August 31.

In conjunction with N.Y. Marketing Research, a series of focus groups was conducted in June to assess product concepts for All Strip and Red Ex.

2. **Plans:** The quantitative concept/product placement study for the low smoke/low odor program is scheduled for September.

A trade-off technique is planned for fourth quarter to evaluate the relative appeal/ benefit of multiple product attributes among smokers in general and among specific smoker groups.

3. **Contributors:** Jan Jones (Product Evaluation Division), Page Callahan (Product Evaluation Division), Melissa Jeltema (Product Evaluation Division), John Tindall (Product Evaluation Division), New York Marketing Research

IV. Objective: Sensory Research Technology

Conduct research of theoretical and applied methodological sensory research to ensure the validity, reliability and effectiveness of PM-USA's subjective testing program.

- A. **Strategy I:** Evaluate methods of streamlining data analysis/chart generation/presentation quality.

1. **Results:** The computer problems (equipment, programs, and skills/people) that the quantitative group were experiencing the last 6 months have been resolved.
2. **Plans:** Evaluate needs on an on-going basis.

- B. **Strategy II:** Conduct competitive product testing.

1. **Results:**

Total number of tests completed	52
Number of 85mm nonmenthol tests	14
Number of 100mm nonmenthol tests	15
Number of 85mm menthol tests	8
Number of 100mm menthol tests	15

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2. **Plans:** Complete third quarter testing.

C. **Strategy III:** Develop and implement a searchable/retrievable POL Results Database.

1. **Results:** The framework of the POL database has been developed and is being tested for global and supplemented data.

2. **Plans:** Further work still needs to be done in the following areas: building master charts, inputting analytical data from previous tests, loading POL raw data, calculating liking regression numbers, and predicted strength numbers for all panels. Classes are underway to learn how to access the data.

V. **Objective:** New Packaging Concepts Added Value

Provide innovative packaging designs, materials, and manual fabrication skills to support new product introductions, strategic goals as related to environmental issues, and existing brands improvement.

A. **Strategy:** Develop packaging that more easily degrades than the current packaging.

1. **Results:** Maintained contact with Nypro to discuss fabrication of a paper fiber package via an injection molded process. Modification of the existing Fox Pack mold is probably required for initial design work. Moulded Fiber Technology of Westbrook, Ma. has also been contacted as an alternative vendor. Samples of their molded packages have been received and a meeting is being scheduled in September to discuss and evaluate their capabilities.

Sheet and roll quantities of Enviroplastic (a composite of about 65% of a water soluble material, polyethylene oxide, and 35% of a water insoluble material such as polyethylene or polystyrene) have been requested for further packaging application evaluations.

2. **Plans:** Identify the vendor who appears to have the best process for making a molded pack from paper fibers. Initiate a confidentiality agreement prior to meeting with Moulded Fiber Technology so that concept discussions can be initiated.

Continue evaluating available technologies and packaging materials related to "biodegradability".

B. **Strategy:** Manually fabricate innovative packaging designs to support the development of new brands and improve existing brands.

1. **Results:** R. Newsome is the R&D representative on the Engineering Packaging Innovative Team. In this role, he has utilized Product Development Services personnel to prepare and evaluate various packaging materials. A wide variety of new packaging designs have been supported by hand fabrication of

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prototypes. These designs include: Booklet Pack, European Oval, Angle Cut Twin 10's, Virginia Slims, packings with no bundle wraps, Red Express, Marlboro "Wides", and Project Beta.

A considerable amount of effort has been devoted to the development of an all aluminum pack. Mock-ups were prepared to simulate drawn packs and support was provided to PED for focus group testing of the concept. A folded version of this pack design is currently under development.

2. **Plans:** Continue to provide support in the form of mock-up fabrication, conceptualization, and participation on the Packaging Innovation Team. Primary focus will be directed to all aluminum pack designs. Continue to monitor innovative packaging materials/concepts available in the literature and through trade shows and other professional contacts.

VI. **Objective:** De-Nic

Develop a family of subjectively acceptable Ultra Low, Low tar and Full Flavor menthol products from filler which, through supercritical CO₂ extraction, has a residual nicotine level of <0.1%.

A. **Strategy:** Development of a Menthol family of De-Nic Products at 3, 11, and 16mg Tar.

1. **Results:** Initial development prototypes were made at 3, 11, and 16mg tar in both the 85 and 100mm constructions. POL tests were requested, made and shipped this quarter for the 100mm products described above (POL #'s 06007, 06008 and 06009). These POL tests have closed and results are currently being tabulated.

Two new Total Blend casings have been developed for use on De-Nic Menthol prototypes. Initial subjective evaluations indicate that these casings offer a response/body improvement in the De-Nic menthol products. Additionally, two new menthol aftercuts are being evaluated in conjunction with these casings.

Hand-made models using dual filter construction have been designed and are currently being fabricated. Models with 15mm PM-Web and 16.5mm 8.0 x 40,000 CA dual filters are also being made for delivery determinations.

2. **Plans:** Analysis of the POL results will provide a base-line for future prototype direction. Models have been requested from Semiworks Large-Scale to evaluate the new casings and aftercuts on the De-Nic Low Tar prototype. Determine the optimum design/construction for the 3mg tar prototype with Web filters and produce product for both internal subjective and analytical evaluation.
3. **Contributors:** T. Gannon, H. Maxwell, J. Shelton (Flavor Technology), G. Patron (Cigarette Technology)

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B. Strategy: Support of the Sensory Technology Program

1. **Results:** The Sensory Technology Group was provided with filler, cigarettes, and analyses from the Calcium Hydroxide cased prototypes. It was previously observed that the pH of filler used for POL 05022 (2% Calcium hydroxide casing) decreased over time. Laboratory experiments with calcium hydroxide applied to De-Nic filler indicate the pH was initially raised to 7.7 but dropped to 6.8 after 48 hours and was stable there for 16 days.
2. **Plans:** Continue to support the Sensory Technology program and evaluate alternate methods to increase filler pH.
3. **Contributors:** T. Gannon, H. Maxwell (Flavor Technology)

VII. Objective: Design and implement an integrated modelling and database management system for Product Development.

A. Strategy II: System Design

1. **Results:** A system layout has been proposed and presented to management. The first phase of the hardware has been budgeted for 1993 with CAD. Work continues on defining the user interfaces.
2. **Plans:** Finish the user interface definition and begin working with CAD personnel in defining the data interfaces.

Continue to observe the information flow through Product Development and present initial user interfaces to the initial group of users.
3. **Conclusions:** None
4. **Contributors:** R. Heretick, C. Altizer (Cigarette Technology)

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EXISTING
PRODUCT SUPPORT

2023135004

PROGRAM NUMBER : 920101-03
PROGRAM NAME : Domestic Product Development & Support, Existing Product Support
PROGRAM COORDINATOR : R. H. Cox/V. E. Willis, G. N. Yatrakis
WRITTEN BY : Contributors
PERIOD COVERED : Third Quarter, 1992

ET/NET

I. **Objective:** To substitute and evaluate NET materials in existing brands.

A. **Strategy:** Evaluate the substitution of NET for DIET processed tobaccos at current and increased levels.

1. **Results:** NET expansion at 595°F was selected for subjective trials of three component blends (NET-3) in Marlboro, B&H and Merit-type blends. After trials of sugar/glycerin cased NET-3 showed subjective potential, subsequent trials of three component blends of Bright, Oriental and Burley showed the most subjective compatibility at 65%, 20% and 15% levels, respectively. Replicate tests are in progress for NET-3 with different levels of glycerin and an alternate humectant to evaluate CV and subjective effects.
2. **Plans:** Select NET-3 from current casing trials for potential POL tests in B&H and Merit configurations in the fourth quarter, 1992.
3. **Contributors:** Flavor Technology, Cigarette Technology, Leaf Blend Group, Process Development, Semi-Works and CTSD.

PED PRODUCT QUALITY PRODUCT

Coordinator Summary: The quantitative POL study to assess the frequency at which menthol and nonmenthol panelists have detected various product defects and level of tolerance for these defects was fielded; data are being analyzed. A series of eight focus groups were conducted in Japan during July to assess consumers' perceptions of quality.

I. **Objective:** Define and measure the determinants of consumers' perceptions of quality.

A. **Strategy:** Conduct consumer surveys to evaluate cigarette defects with respect to their importance to consumers and consumers' awareness of them.

1. **Results:** A menthol and nonmenthol quality survey was fielded among more than 9,000 POL panelists to assess satisfaction with their current brands, frequency of detecting 42 (plus 2 menthol) defects within the past six months, and propensity to switch brands if these defects were to occur once in six months, once a month or once a week. Data from 4,000 panelists are being analyzed, with results available early September.

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Measures of incidence and importance on five quality defects are being made using the repoll and brand update ballot.

Eight focus groups were conducted in Tokyo, using a discussion guide similar to that used in the U.S. focus groups conducted in April. As in the U.S., Japanese consumers give manufacturers high marks for product quality and report that the frequency of experiencing defects is very low. Insights were derived as to the interplay of image, quality and product features influencing consumers' brand perceptions.

2. **Plans:** Quality Audit measures of defect frequencies will be compared to frequencies of customer complaints to provide a measure of the relative importance of those defects.

Visual detection experiments have been cancelled. When the quality survey is completed, the need for these experiments will be assessed. Evaluation of actual cigarette and packaging defects by consumers was postponed until 1993, when the need and scope of this study will be determined.

3. **Contributors:** Ennis, Gear, Jones, Callahan, Manwaring, Tindall, Ferro, LeGauffey (PED); Dorer, Pillow, Young (QA).

B. Strategy: Analyze taste/odor/stale complaints to relate their frequencies to brand and smoker group characteristics - 2nd Quarter.

1. **Results:** Analyses of TOS complaint rates (per billion) as a function of brand delivery, brand flavor (menthol, nonmenthol) and smoker gender have been done. Analyses of the relationship between TOS and other complaint rates, demographics and other factors are in progress. Investigations continue on the applicability of control chart procedures to complaint data, but initial results have been obtained.

2. **Plans:** Analyses of the relationship between complaint rates and other factors will be completed the end of September. Investigations of the applicability of control chart procedures to complaint data also will be completed the end of September.

3. **Contributors:** Gear, Tindall.

C. Strategy: Conduct surveys of complainants about TOS and other defects - 2nd Quarter.

1. **Results:** A method has been implemented for collecting and analyzing the sensory characteristics of reported stale cigarettes and usual brand experience.
2. **Plans:** Collect data on stale complaints during 1992 and provide continuous guidance on its interpretation.

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3. Contributors: Ennis (PED); Young (QA).

PACKAGING STUDIES

I. Objective: Qualify a supplier of waterborne printing ink.

A. Strategy: Establish a partnership with an ink company committed to waterborne ink.

1. Results: Reformulated waterborne ink vehicles were submitted by ICI/Thiele-Engdahl. These new vehicles were both analytically and subjectively acceptable. Printing problems with these new vehicles are being evaluated by Purchasing Technical Services. Material from the print trials are being evaluated for analytical and subjective acceptability.
2. Plans: Third quarter plans for the waterborne ink system are to begin manufacturing trials on one brand. Cylinders and print schedules are being developed by Purchasing Technical Services.
3. Contributors: C. Kroustalis, B. Mait, Solvent Panel, G. Patskan, Purchasing Technical Services.

B. Strategy: Develop an analytical method for the quantitation of the solvent components used in waterborne ink systems.

1. Results: No significant progress has been made in development.
2. Plans: Various analytical techniques are being examined to determine the most appropriate for this method.
3. Contributor: G. Vilcins, C. Keene.

II. Objective: Qualify suppliers of offset printing for use on promotional items and low volume brands.

A. Strategy: Qualify a second source of the Hostmann-Steinberg offset printing method.

1. Results: Cartons were reprinted at Somerville Packaging in Newport News. Analytical evaluation of the various printing components did not find anything out of the ordinary for offset printing. These cartons were found unacceptable subjectively.
2. Conclusions: Somerville is not qualified as a second source of Hostmann-Steinberg printing.

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B. Strategy: Develop an analytical procedure for determining components present in offset printing ink.

1. **Results:** Material printed using the offset method is being examined by Purge & Trap-GC/MS methodology. Work continues on evaluating the individual components in the system.
2. **Plans:** Continue to evaluate the Purge & Trap-GC/MS technique for method development.
3. **Contributors:** G. Vilcins, C. Keene, K. Dudzinski.

III. Objective: Qualify packaging material for new brands, line extensions and promotional items.

A. Strategy: Evaluate new items for analytical and subjective acceptability.

1. **Results:** The following major packaging/promotional items were evaluated and accepted for use:

Packaging

Marlboro Red Express "Roof" label

Marlboro Lights Express "Roof" label

Virginia Slims Graphics change (labels, blanks and cartons)

Marlboro Medium 100 (labels, blanks, cartons).

Promotional Items

Marlboro Adventure Team

Marlboro Half Cartons

Virginia Slims Superslims Sleeve

Merit Carton Insert

Parliament Carton Insert

2. **Plans:** Continue to evaluate on an as-requested basis.
 3. **Contributors:** B. Mait, R. Dunaway, R. Hale, T. Cravotta, Solvent Panel and Purchasing Technical Services.
- B. Strategy:** Evaluate and qualify packaging material for analytical and subjective acceptability.

1. **Results:** Analytical determinations were made on 418 samples. One hundred nineteen samples were subjectively evaluated.
2. **Plans:** Continue to evaluate on an as-requested basis.
3. **Contributors:** B. Mait, R. Dunaway, R. Hale, T. Cravotta, Solvent Panel, Purchasing Technical Services.

IV. **Objective:** Revise and update specification levels of the gravure solvent mixtures used to print packaging material.

A. **Strategy:** Determine the threshold levels of various printing solvents. Correlate the threshold levels to specification levels for these same solvents.

1. **Results:** Organoleptic thresholds of two new gravure solvent systems (I & II) have been determined. Determination of System III's threshold (water base system) is in progress.
2. **Plans:** Determine System III's threshold. Determine the impact of methanol on threshold and specification levels.
3. **Contributors:** T. Cravotta, B. Demian, Solvent Panel.

V. **Objective:** Determine the effects of high barrier film on our product. To provide an analytical procedure for measuring permeability of flavor compounds on different overwraps.

A. **Strategy:** Develop an analytical technique which will determine the barrier properties of overwraps, current and developmental.

1. **Results:** A standard purge-and-trap procedure has been developed to measure vapor phase transfer of model solvent and flavor mixtures through overwrap. Reproducibility of the existing system, however, has been inadequate for many determinations. One source of this variability appears to be the o-rings which hold the overwrap in place during the experiment. Depending on the overwrap, there may be undue stretching or inadequate sealing. Gaskets are being evaluated as replacements for the o-rings. An appropriate material is needed which both seals the overwrap well and also has minimal vapor phase background which could interfere with determining target compound permeation.

2. **Plans:** Continue to support this project.

3. **Contributor:** J. Pierotti

B. **Strategy:** Determine the impact of the improved sealant layer developed by Hoechst for their high barrier OPP films on pack seal efficiency. Determine the impact of the Hoechst film on the product's ability to maintain targeted moisture levels in the

desert and jungle rooms. Perform a preliminary subjective test to qualify the Hoechst High Barrier films.

1. **Results:** Subjective evaluations show the high barrier film required longer equilibration times compared to the standard 80 gauge films. OV's were more stable with the high barrier films; however, no subjective advantage was apparent for the products under evaluation at this time. The subjective characterization for the high barrier film were different compared to the control. Recommendations for additional testing and the inclusion of flavor tracking were given. Additional testing has been initiated with the B&H SP with the Hoechst 120 gauge film. Environmental conditions have been expanded to include the following: Ambient, Cycling cabinet, Desert, Jungle and Warehouse.
2. **Plans:** Issue a completion report for the first series of testing. Complete testing for the additional storage studies with the expanded environmental conditions. Make subjective based recommendations.
3. **Contributors:** Quality Assurance, P. Thomas, D. Wittkamp, K. Deane, V. Willis and Flavor Technology Film Panel.

VI. Objective: Determine if products with Flavorseal packaging maintain their physical, chemical and subjective properties longer than products with polypropylene overwrap.

A. Strategy: Compare the 80 gauge standard polypropylene overwrap with the metallized film overwrap. Determine the impact on OV retention, flavor retention and subjectives.

1. **Results:** Testing with the Merit 85mm products has been initiated with the metallized foil overwrap. The testing includes environmental conditioning, analytical, microbial and subjective monitoring. Preliminary subjective recommendations will be given at the end of six weeks of environmental storage testing.
2. **Plans:** Complete the testing and make subjective based recommendation. Correlate subjective, flavor and analytical data.
3. **Contributors:** Quality Assurance, P. Thomas, D. Wittkamp, K. Deane, V. Willis, Flavor Technology Film Panel and Semi-Works Panel.

FACTORY MODERNIZATION SUPPORT

I. Objective: To provide support for the subjective qualification of factory primary modernization programs.

A. Strategy: Qualify new P & S Dryers at the MC.

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1. **Results:** P & S Dryer #3 has been qualified for use at single rate and double rate at the Manufacturing Center.
 2. **Plans:** Qualify P & S Dryer #2 at single rate in September and at double rate in November, 1992.
 3. **Contributors:** D. Spruill, B. Bell, J. Sherron, B. Rainey, R. Bowman and J. Sowers
- B. **Strategy:** Qualify reconditioned S-2 CO₂ storage tank at M/C.
1. **Results:** Subjective evaluations were conducted on products from the May trials. The products were acceptable. S-2 CO₂ storage tank was qualified for use at the Manufacturing Center.
 2. **Contributors:** D. Spruill, J. Swain and B. Bell
- C. **Strategy:** Qualify reconditioned S-1 CO₂ storage tank at Cabarrus.
1. **Results:** Subjective evaluations were conducted and the S-1 CO₂ storage tank was approved for production.
 2. **Contributions:** D. Spruill, J. Swain and B. Bell
- D. **Strategy:** Qualify DIET stem reclamation from the VT separator.
1. **Results:** The second test was subjectively rejected. R&D Engineering is investigating varying levels of stem inclusion in the process.
 2. **Plans:** Pilot trials will be conducted with varying levels of inclusion. Cigarettes will be produced in R&D's Semi-Works for subjective evaluation.
 3. **Contributors:** D. Spruill, B. Bell, P. Aument
- E. **Strategy:** Qualify new tanks for alcohol base flavors at MC primary.
1. **Results:** In addition to the new tank and computer control center, the burley top casing and Marlboro aftercut were also qualified at the Manufacturing Center.
 2. **Contributors:** D. Spruill, B. Bell, D. Sims and J. Sowers
- II. **Objective:** Evaluate and modify Semi-Works small scale to achieve parity with large scale.
- A. **Strategy:** Establish operating procedures and processing parameters for the new equipment.

1. **Results:** Several runs were made in small scale this quarter. Subjective evaluations were not conducted on the model due to differences in physicals. Activities continue to focus on bringing the physicals of the small scale products in line with the large scale products.
 2. **Plans:** Establish operating procedures and processing parameters for the new equipment by the end of 1992.
- B. **Strategy:** Compare small scale and large scale Semi-Works production with the factory production for Marlboro Standard X.
1. **Results:** Four models were produced for evaluation in addition to the Marlboro Standard X models. The four models produced were Marlboro without overtopping, Marlboro with cased burley pull from large scale and remainder of processing completed in small scale, Marlboro processed in large scale except for ET, ES and aftercut which was applied in small scale and a Factory control from Stockton Street. The cigarettes are presently being analyzed.
 2. **Plans:** Conduct subjective evaluations on the above products on the Flavor Technology, Semi-Works and Marlboro Standardization Panels. Additional request have been submitted for duplication of the above testing. Evaluate burley processing in small scale and make modification to bring it closer to large scale processing.
 3. **Contributors:** B. Bell, S. Skalak, V. Willis, M. Tallman, T. Skidmore

TOBACCO MATERIALS AND RECLAMATION

- I. **Objective:** Subjectively evaluate returned goods and/or out of specification filler to determine most cost effective disposition
- A. **Strategy:** Determine most cost effective disposition (ripper, expanded, sheet products) of filler while maintaining subjective integrity.
1. **Results:** Samples have been evaluated as submitted and recommendation made.
 2. **Plans:** Continue evaluations as products become available.
 3. **Contributors:** Flavor Technology

PROCESSING PLANT SUPPORT

Coordinator Summary: Renewed efforts to qualify increased line speed at the BL Plant are based upon increased RCB requirements projected for 1992 and 1993. Trials are in progress to qualify 350 fpm on each line in an effort to minimize overtime operations and reduction in inventories.

Results of projects in support of Park 500 will be reported in the fourth quarter.

Projects in support of the Flavor Center continue to show progress with only minimal delays in qualification of alternate vendors.

I. Objective: To increase capacity by increasing line speed at the BL Plant.

A. Strategy: Conduct a dryer study to determine the temperature profiles for each line at the BL Plant in order to predict standardized dryer profiles needed at increased line speed.

1. **Results:** Air flows and zone temperatures were determined on each line at the BL Plant prior to sampling each RCB line for subjective comparisons to the blended lines. From subjective results, Line 2 was closest to the blended control and was selected to adjust similar conditions on Lines 1 and 3.

After standardization of dryer conditions, trials of increased line speeds of 340, 350 and 360 fpm were made at profiles predicted from a computer model. A decision at the request of the BL Plant was made to concentrate efforts to qualify 350 fpm to satisfy projected requirements. Initial trials at the BL Plant on individual lines have shown earlier conditions on Line 1 at 350 fpm to confirm subjective parity. Line 1 remains at the increased speed while trials are in progress to evaluate and qualify the other lines through internal panel tests.

2. **Plans:** Continue to support qualification of modifications to optimize capacity while maintaining subjective quality.
3. **Contributors:** Flavor Technology, Process Development, BL Plant, Cigarette Technology, Semi-Works, CTSD and ARD.

II. Objective: To evaluate and qualify BLT with liquid flavors, unwashed Burley stems and reduced humectants.

A. Strategy: After individual qualification POL tests of RCB with liquid flavors and reduced humectants, these modifications were combined to test BLT with unwashed Burley stems.

1. **Results:** Further BL Plant production trials of BLT were made for replicate POL's in a reformulated Marlboro blend. POL 03072 and 03080 were made, evaluated and shipped in August.
2. **Plans:** Pending results of the POL's, plans for implementation will be recommended when feasible.
3. **Contributors:** Flavor Technology, Process Development, BL Plant, Cigarette Technology, Semi-Works, CTSD and ARD.

III. Objective: To increase the utilization level of mentholated tobacco dust in RCB at the request of the Leaf Department.

A. Strategy: Mentholated ripper shorts were selected to represent a source of high mentholated Class 6 for BL Plant trials.

1. **Results:** Normal and increased blend levels of Class 6 were made, analyzed and subjectively evaluated. Subjective differences were found for RCB with 20% Class 6 while 15% Class 6 showed no obvious differences compared to the RCB control.

2. **Plans:** No further tests of Class 6 are planned. Higher levels in RCB are not feasible.

3. **Contributors:** Flavor Technology, Leaf Blending Group, BL Plant, Cigarette Technology, Semi-Works, Operations Services, CTSD and ARD.

IV. Objective: To support cooked flavor production, qualification of alternate vendors and improved process control of the reactor at the Flavor Center.

A. Strategy: Flavor Technology personnel will support these goals through collaborations with Operations Services, Engineering, Purchasing and Flavor Center personnel to formulate and evaluate cooked flavor with alternate materials and evaluate 75-814 from the automated reactor system.

1. **Results:** Flavor Center trials of an alternate source of sugar in 75-814 are planned for September. Further modifications of the alternate amino acid are in progress due to differences in solubility prior to scheduling Flavor Center trials.

Meetings with Engineering and Flavor Center personnel are being held to develop specifications for automation of the cooked flavor reactor.

2. **Plans:** Complete qualifications of the alternate sugar and amino acid in 75-814 through internal panel tests of Pilot and Park 500 RLTC in the fourth quarter of 1992.

Continue to assist in establishing design and product specifications for qualification of automated system in the first quarter, 1993.

3. **Contributors:** Flavor Technology, Process Development, Park 500, Cigarette Technology, Semiworks, Operations Services, Purchasing, CTSD and ARD.

SUBJECTIVE PANELS

I. Objective: To provide subjective evaluations of prototypes, modifications of existing brands, new brands and competitors' products.

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- A. **Strategy:** Conduct evaluations for development programs, monitoring of domestic competitive brands and any problems associated with production and/or processing plants.

1. **Results:** Subjective results have been issued for the Glycerin/Triacetin study. Two series of maker hold times have been completed for Project Gold. Results have been issued for Project Gold (August 1 trials in Cabarrus) adhesive test.

Subjective characterizations of ten competitors brands have been completed. A total of 68 panels were completed for developmental programs within R&D this reporting period.

The following brands have been subjectively evaluated for release: Basic Ultra Lights 85 and 100mm SP, Best Buy Menthol 100mm SP, Bristol 85 and 100mm SP, Bristol Lights 85mm and 100mm SP, Bristol Ultra Lights 85mm and 100mm SP, Cambridge and Cambridge Lights 85 and 100mm SP, B&H Regular and Menthol 85mm, B&H Lights Regular and Menthol 85mm, and Full Flavor Menthol 85mm SP.

The Film panel has subjectively evaluated sixty-four sets of B&H's with the high barrier film exposed to environmental conditions.

2. **Plans:** To complete the subjective testing for the following programs: Glycerin/Triacetin study(re-make), Alternate Film overwrap, Project Gold and storage studies presently in progress. Continuation of subjective support for factory issues, new equipment qualifications, developmental programs, new product development prototypes and competitors products.
3. **Contributors:** K. Deane and Flavor Technology Domestic Panels (Domestic and Film).

II. **Objective:** To provide training, maintenance and support to auxiliary panels (e.g, Richmond, Semi-Work, Filter and Paper and Cast Leaf Panels.

- A. **Strategy:** Train auxiliary panels to screen development prototypes and to judge acceptability of final products.

1. **Results:** The Filter and Paper panel has completed training on blends and blend components (cased and uncased). The Semi-Works panel training is complete. The panel members are presently evaluating the environmental storage studies for alternate film on Merit products. To date they have evaluated a total of thirty-nine sets. The Cast Leaf panel continues to evaluate models of BL, NBL and Cast Leaf (Guar binder) prototypes.
2. **Plans:** Continue training of all panels with blend changes, new products and modification of products. To begin training on the Richmond Panel when time permits.

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3. **Contributors:** K. Deane, Semiworks, Cast Leaf, and Filter and Paper Panels.

III. **Objective:** To provide subjective evaluations of development prototypes, modifications of existing brands and export (PM and competitors') brands.

A. **Strategy:** Continue to monitor existing brands and provide subjective evaluations for prototype development. Further training will be conducted to standardize panels.

1. **Results:** The International Panel has completed subjective profiles for ten products. The following brands have been subjectively evaluated for release: Lark 85mm SP and FTB, Lark Mild FTB and KS, Merit Lights 85mm (14's) SP, Chesterfield 85mm SP, Marlboro GCC 85mm SP and Parliament 85 and 100mm SP.

The International Panel has completed training on blends and blend components (cased and uncased).

2. **Plans:** Continuation of subjective support for developmental programs, new product development prototypes, storage issues and competitors products profiles. Continue training for the International Panel.

3. **Contributors:** K. Deane and International Panel.

MARLBORO STANDARDIZATION

I. **Objective:** To identify and reduce sources of variations in PM brands between production and processing facilities.

A. **Strategy:** Conduct factory pickups and a standard run to monitor the quality of Marlboro by subjective and analytical testing.

1. **Results:** The final reports on subjective and analytical data have been completed for the Marlboro Lights (KS and LS) pick-up on March 26th and the Marlboro (KS and LS) pick-up on May 29th. Marlboro Lights (KS and LS) and Marlboro Medium 100mm SP were requested on July 1st from all locations and tested analytically. Both products were within specifications.

The Standardization panel also evaluated four development prototypes on Marlboro KS. Subjective results has been issued.

Standard Run X was conducted in all locations including Semi-Works during the week of August 10th. All locations produced Marlboro KS and LS.

2. **Plans:** Issue final report on subjective and analytical testing of Standard Run X in October, 1992.

3. **Contributor:** K. Deane, Marlboro Standardization Panel and Factory Panels.

II. **Objective:** Provide training, maintenance and support to factory panels which could possibly identify and reduce sources of taste/odor/stale customer complaints.

A. **Strategy:** Training for factory panels and quarterly panel leader workshops will be conducted. The factory panels will monitor their daily production which could identify and possibly reduce taste/odor/stale customer complaints. Factory panels will also evaluate factory pickups and Standard Run X for monitoring purposes.

1. **Results:** The Stockton Street panel has completed blend and blend component (cased and uncased) characterizations. Currently, they are monitoring daily production of B&H Special Kings Regular and Menthol (Lights and Full-flavored).

2. **Plans:** To conduct Factory Panel Leadership Workshop during the month of November, 1992 on different test methodologies. Initiate panel training at the Manufacturing Center. Monitor the Stockton Street panels. Resume panel training at Cabarrus and Louisville when non-production days occur.

3. **Contributors:** K. Deane and Factory Panels.

III. **Objective:** Subjectively test externally (POL testing) Marlboro product from different production locations.

A. **Strategy:** POL testing (monadic evaluation) of scheduled factory pickups and cigarettes produced from Standard Run X. This will aid in defining Marlboro control regions and develop new statistical methods.

1. **Results:** POL testing of standard production from the following facilities has been completed: Stockton Street SP and FTB, two Cabarrus KS, two Semiworks KS, Manufacturing Center KS and Louisville KS. POL testing of Standard XI is scheduled for December, 1992 with results being issued by March, 1993.

2. **Plans:** POL's will be conducted on Standard Run X with results being available by November, 1992.

3. **Contributor:** A. Smith

CIGARETTE STORAGE/TRANSPORTATION/SHIPPING STUDY

I. **Objective:** Define the impact of cycling temperature and humidity typically seen within shipping containers and the effects of heating and cooling cycles on product discoloration, staining, subjectives, and analyticals.

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A. **Strategy:** Repeat the testing conducted at KGF during the first quarter with specified models and conditions from the Export Product Standardization - Singapore and the GCC Study to determine the effects of cycling temperature and humidity conditions in the shipping containers. Conditions will be simulated in a controlled environmental chamber at PM at lower temperature ranges.

1. **Results:** Subjective differences were detected between samples with time. Analytical data showed that the loss of anethole and vanillin from the filler continued with time. No significant differences in spotting were detected between the samples under similar conditions. The decrease in temperature and humidity of the environmental chamber produced acceptable products longer than previous testing conditions.

2. **Plans:** Issue final report.

3. **Contributors:** Flavor Technology and Quality Engineering.

II. **Objective:** Determine the impact of adverse environmental conditions upon the subjective character and analytical specifications of finished products. Compare the results of this study with similar studies conducted using products with carbon filters.

A. **Strategy:** Environmental testing with subjective and analytical monitoring to determine the effect on subjectives and flavor at adverse conditions.

1. **Results:** Repeat testing initiated with the metallized foil on Merit 85mm products. The testing includes extended environmental conditions and analyses for the filters and packaging materials to determine if the flavor components are lost from the pack or if they are trapped in the filter or packaging materials.

2. **Plans:** Complete testing and make recommendations.

3. **Contributors:** K. Deane, P. Thomas, D. Wittkamp, Semi-Work Panel, FTD Analytical Group, CTSD and ARD.

BRAND MAINTENANCE

I. **Objective:** To assist Technical Services personnel in making recommendations for corrective actions to keep all current brands within specified delivery targets.

A. **Strategy:** Recommend change.

1. **Results:** Recommended changes as needed.

B. **Strategy:** Teach and train.

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1. Results: Ongoing.
2. Contributor: W. Clafin

2023135019

FLAVOR
TECHNOLOGY

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PROGRAM NUMBER : 920101-04
PROGRAM NAME : Domestic Product Development & Support, Flavor Technology
PROGRAM COORDINATOR : R. H. Cox/C. S. Kroustalis
WRITTEN BY : Contributors
PERIOD COVERED : Third Quarter, 1992

PROJECT GRAIN

Coordinator Summary: This program is on schedule. Implementation has been delayed until January, 1993 for business reasons. Australian factory trials are scheduled for October, 1992 to determine large-scale feasibility.

I. Objective: Incremental alcohol reduction in aftercut (AC).

A. Strategy: Conduct factory trials with reduced alcohol levels in AC in conjunction with alcohol-free BTC.

1. **Results:** Successful trials were conducted at the Manufacturing Center with 40 and 52% total alcohol reductions. Subjective parity was achieved in both cases. Successful Semi-Works trials with 52% total alcohol reduction in B&H 100's and Virginia Slims were completed. Both products achieved subjective parity. A Merit KS trial with 61% total alcohol reduction was conducted at Cabarrus successfully. Analytical and subjective evaluations are pending. Transmittals for 5% alcohol reduction in all AC's with alcohol-free BTC were issued.
2. **Plans:** Continue evaluations with incremental alcohol reductions as planned. Support implementation as required.
3. **Contributors:** S. Ruziak and H. Maxwell

B. Strategy: Reduce/rearrange PG in flavor system in combination with alcohol-free BTC and AC alcohol reduction.

1. **Results:** POL 03042 results indicated subjective differences. Models will be prepared for POL 03044 with 67% total alcohol and 25% PG reductions which is scheduled for shipment in October, 1992.
2. **Plans:** Conduct factory trials with 52% total alcohol and 25% PG reductions in December, 1992. If POL results are acceptable, conduct factory trials with 67% total alcohol and 25% PG reductions in June, 1993. Support implementation as needed.
3. **Contributor:** S. Ruziak.

C. Strategy: Remove all alcohol from aftercuts used in Australian brands to conform with government flash point requirements.

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1. **Results:** All AC's and preblends were reformulated to achieve flash point criteria and acceptable application rates. Formulas for preblends and flavor systems were transmitted to the Flavor Center. The Flavor Center is in the process of preparing the preblends for shipment. Flavor systems include Marlboro, Alpine, Star and Phoenix.
2. **Plans:** Australian factory trials are scheduled to be conducted in October, 1992 to determine conversion feasibility.
3. **Contributors:** H. Maxwell and S. Ruziak.

STABLE MENTHOL

Coordinator Summary: This program was terminated as a result of cost and lack of success. Some low level activity will continue for evaluation of potential alternatives.

HUMECTANT REDUCTION

Coordinator Summary: The implementation of reduced humectants in domestic reconstituted tobaccos has been postponed for business reasons until January, 1993. Results are reported under "Existing Product Support" under "RCB."

ALTERNATE HUMECTANTS

Coordinator Summary: Processing Plant trials will take place after the Christmas shutdown because propyl paraben must be removed from the system and replaced by its potassium salt.

- I. **Objective:** Produce reconstituted tobacco materials with alternate humectants for cost reduction and defensive purposes.
 - A. **Strategy:** Develop and evaluate alternate humectants replacing PG and glycerin in PM brands.
 1. **Results:** POL 03026 results indicated subjective differences. Models were made with Pilot Plant materials of differing ages.
 2. **Plans:** Additional POL testing will be made with reconstituted materials produced in the Processing Plants and freshly prepared expanded tobacco. These materials will be produced after the Christmas shutdown because the systems need to be purged and the preservative must be replaced with the potassium salt of propyl paraben.
 3. **Contributors:** S. Ruziak and J. Swain.

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LIQUID LICORICE

Coordinator Summary: It is recommended that this program be terminated as a result of mixed POL results and especially increased costs and very short inventories which would put manufacturing production at risk.

MARLBORO RI

I. **Objective:** Develop a Marlboro Flavor System containing fewer than 40 listed components which support the subjective character in Marlboro cigarettes.

A. **Strategy:** Develop new reduced-ingredient flavor system and subjectively evaluate blend modifications.

1. **Results:** POL 3043 of Marlboro RI cigarettes with modified flavors, NET-3, RLL, IS and blended strips was rejected by the Richmond Panel. The remake (POL 3045) of Marlboro RI was made with flavors compounded from fresh materials, DIET (special cased), RLL, IS and blended strips. Analyses were on target and the Richmond Panel released the cigarettes to be shipped September 8.
2. **Plans:** Repeat POL tests with modified flavors and/or blend if warranted.
3. **Contributors:** Flavor Technology, Process Development, Cigarette Technology, Semi-Works, CTSD and ARD.

DISCOUNT RI

Coordinator Summary: No activities planned for this period.

REVISIONS

I. **Objectives:** To eliminate unwanted ingredients from PM Direct Materials, to reduce ingredients, to simplify sourcing of materials and to assist the Flavor Center with evaluations of quality and flavor issues.

A. **Strategy:** Subjectively evaluate revised and first shipment samples for acceptability.

1. **Results:** Three revised and one first shipment samples were evaluated and approved.

B. **Strategy:** Identify alternate vendors for current Direct Materials and subjectively evaluate submissions.

1. **Results:** Two materials from alternate suppliers were subjectively evaluated and approved at the request of Technical Services.

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C. **Strategy:** Reduce the number of sole source ingredients and remove unwanted flavor components.

1. **Results:** To date, seventeen of twenty-one Direct Matreial flavors from one vendor have been evaluated and were recommended for removal from the PM Direct Materials list. Formulations of replacements with other existing Direct Materials will be transmitted to Technical Services.

D. **Strategy:** Assist the Flavor Center with subjective evaluations on flavor quality related issues.

1. **Results:** Twelve Direct Materials ingredients were evaluated against controls and approved for use.

2. **Plans:** Continue subjective evaluations for the above strategies as required.

3. **Contributors:** J. Pflueger, D. Williams, M. B. Lambert, C. Comes, G. Nixon, P. Andrews, S. Johnson, W. Thomas and E. Tucker.

PROJECT LEVO

I. **Objective:** Develop synthetic menthol products to decrease PM's dependence on natural menthol.

A. **Strategy:** Develop and evaluate menthol flavor systems using synthetic menthol to replace natural menthol.

1. **Results:** Cigarettes were produced and shipped for POL testing. POL's 04030 (Marlboro Menthol) and 04031 (Merit KS Menthol) are expected to close by mid-September, 1992.

2. **Plans:** Price value products will be converted to synthetic menthol if POL results are acceptable.

3. **Contributors:** J. Shelton and B. Monahan.

II. **Objective:** Remove exotic flavors from MPZ in all menthol products while maintaining subjective integrity.

A. **Strategy:** Develop prototypes without the exotic flavor and evaluate against controls.

1. **Results:** Marlboro Menthol-type cigarettes were made and evaluated internally. There were no significant subjective differences between control and test cigarettes.

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2. **Plans:** Evaluations will continue with B&H 100's Menthol, Merit KS Menthol and on all remaining menthol products. POL testing may be considered if deemed necessary.
3. **Contributors:** J. Shelton and M. White.

SYNTHETIC/NATURAL GLYCERIN AND TRIACETIN

Coordinator Summary: This program is on schedule. POL testing, if necessary, will be conducted during the first quarter of 1993.

- I. **Objective:** Establish analytical and subjective acceptance criteria for natural glycerin. Qualify natural glycerin-based triacetin as a filter plasticizer.

- A. **Strategy:** Analytical characterization of glycerin and triacetin impurities.

1. **Results:** Identification of impurities in glycerin and triacetin are essentially complete. Lot-to-lot variation of ten production batches of triacetin from each of two vendors indicate consistency of product.
2. **Plans:** Continue with the identification/confirmation of remaining impurities. Improve analytical test procedure for acceptance.
3. **Contributors:** K. Lam, R. Hale and B. Johnson.

- B. **Strategy:** Subjective evaluations of natural glycerin/triacetin.

1. **Results:** Internal subjective evaluations indicate that there were no significant differences between control and test cigarettes.
2. **Plans:** Natural glycerin will be re-evaluated internally with an all strip blend because of the possible contribution (dilution) effect from the recon products in the original blend. Triacetin subjective evaluations will be repeated with a higher PZ level to confirm previous results. POL's will be scheduled in the first quarter of 1993 if needed.
3. **Contributors:** K. Lam, R. Hale, A. Finley, E. Tucker and FTD panel.

UNCOOKED FLAVOR SYSTEM

- I. **Objective:** To replace cooked flavor for RLTC due to possible regulatory changes.
- A. **Strategy:** Develop, evaluate and test alternate flavor in RLTC.

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1. **Results:** Two lab scale test flavors have been developed and evaluated. Pilot Plant lots of RL (25 lb. per lot) have been produced with control and test flavors.
2. **Plans:** Production of prototypes in Semi-Works small scale have been requested. These prototypes will be evaluated internally and flavor modifications will be made as needed.
3. **Contributors:** J. Swain, B. Taylor, K. Deane, N. Jackson and R. Uhl.

BURLEY SPRAY SPECIFICATIONS

Coordinator Summary: Issues with several Burley Spray components are still being identified and defined. New Primary Process requirements have also affected the development of specifications. As a result, Burley Spray component specifications development has been expanded to include the current system, NPP, licorice replacement and casings for generic products.

- I. **Objective:** Develop current Burley Spray processing specifications for Factory Primaries.
 - A. **Strategy:** Evaluate reduced holding temperature for Burley Spray.
 1. **Results:** No activities planned for this period until casing needs definition is clear.
 - B. **Strategy:** Consolidate Cambridge/Bristol casing system.
 1. **Results:** The Cambridge/Bristol blend and casing consolidation have been completed and implemented under the Brica name. Licorice was removed from the Burley Spray while cochise and petreo were replaced by M-10.
 2. **Plans:** None.
 3. **Contributors:** W. Bell and D. Spruill.
 - C. **Strategy:** Remove licorice and replace Baker's chocolate in current Burley Spray.
 1. **Results:** Marlboro-type models have been produced without licorice and with Baker's chocolate replacement in Burley Spray in the Semi-Works large scale. Controls were also produced with the same lot of tobacco for internal evaluations.
 2. **Plans:** Subjectively evaluate control and test internally. If no differences are found, these prototypes will be submitted for POL testing.

3. **Contributors:** W. Bell and D. Spruill.

D. **Strategy:** Analytically fractionate black licorice for evaluation and development of licorice substitute.

1. **Results:** After starch and gum removal of black licorice extracts, the extracts have been fractionated into ten fractions by preparative HPLC.

2. **Plans:** Evaluate these fractions subjectively and further fractionate those which show subjective promise.

3. **Contributor:** B. Demian.

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INTERNATIONAL
PRODUCT DEV.

2023135028

PROGRAM NUMBER : 920103
PROGRAM NAME : International Product Development
PROGRAM COORDINATOR : J. N. Smith and A. H. Confer
WRITTEN BY : A. Confer, J. Easley, V. Graff, J. Hickie, D. Lambert,
D. McRae, D. Sealey, R. Slagle, J. Smith, B. Tierney
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary: L&M Lights, launched in June, 1992 in Brazil, has grown to approximately 130 million cigarettes per month. This growth has prompted development requests from Costa Rica, Dominican Republic, and Ecuador for L&M Lights.

The three-year product plans for Asia licensees were reviewed. Negotiations with the People's Republic of China are now focused on PM building a primary there, and selling Marlboro cut filler to licensed cigarette factories. A decision in principle is expected in September.

Three-year plans for Latin America affiliates will be available by October.

- I. **Objective:** Contribute to the attainment of Strategic Goal 1 by supporting the existing products of affiliates and licensees.

A. **Strategy:**

Corporate Product Improvement - Design changes that improve/standardize corporate products. Assist with consumer testing and implementation.

1. **Results:**

Marlboro

Costa Rica - Prototypes were made with 10% imported Turkish tobacco replacing 15% Guatemalan Oriental. However, ventilation was too high.

Mexico - The difference in tar delivery of the Mexico City vs. Guadalajara prototypes was about 3mg. Therefore the prototypes were not approved for consumer testing.

Philippines - The PMI test of Prototype Alpha vs. Control was positive (95% confidence level). The prototype incorporates changes in the blend and AC flavor.

Venezuela - Prototypes containing 8% Oriental and no carbon in the filter were made at three ventilation levels.

Parliament

Argentina - Remake of the prototype was postponed.

2. Plans:

Marlboro

Costa Rica - Prototypes will be remade with optimized cigarette construction. USA-sourced casings/flavors will be utilized.

Mexico - A team of IOS and Leaf personnel will resolve the factory-to-factory variation. The factory trials will then be rerun (tentatively 1st Qtr. '93).

Philippines - The changes will be implemented stepwise through 1st Qtr. '93, completing the project.

Venezuela - Consumer testing of the selected prototype will begin 4th Qtr. '92.

Parliament

Argentina - Parliament, B&H, and Virginia Slims prototypes incorporating standardized casing/flavor systems will be produced 4th Qtr. '92.

II. Objective: Contribute to the attainment of Strategic Goal 2 by developing products for affiliates and licensees.

A. Strategy:

Corporate Product Development - Develop corporate products according to PM USA guidelines.

1. Results:

Marlboro

Dominican Republic - The Lights Menthol prototype was remade, yielding the targeted menthol delivery.

Malaysia - The Marlboro Lights prototype was produced and approved.

Mexico - The Lights Menthol prototype was remade, but again the targeted menthol delivery was not met.

Puerto Rico - The PMI tests of Marlboro vs. Winston and Marlboro Medium vs. Winston were begun.

Virginia Slims Menthol

Philippines - A non-ventilated prototype was produced in Richmond utilizing PM 100's Menthol cut filler shipped from Philippines.

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2. Plans:

Marlboro

Dominican Republic - The product will be launched 4th Qtr. '92, completing the project.

Malaysia - The product will be launched 4th Qtr. '92, completing the project.

Mexico - The prototype will be remade 4th Qtr. '92.

Puerto Rico - The PMI tests will be completed 4th Qtr. '92.

Virginia Slims Menthol

Philippines - A concept test will be conducted in Philippines with this prototype during 4th Qtr. '92.

Coordinator Summary: The export production standardization study is now complete. A summary report with recommendations has been approved. The implementation program will be finalized in the third quarter 1992.

Total conversion to the PMCC carbon is complete for Lark. Machinability trials are planned for September to evaluate the PM specification carbon on Parliament. Conversion to this material is scheduled to be complete by December, 1992.

In addition to Lark Milds KS SP, now Lark Milds KS FTB and Lark FF FTB are successfully utilizing the KC porous heatseal combining wrap. Conversion of all Lark brands to this material will be complete by December, 1992.

The Merit Lights KS in Korea was produced starting in July, 1992. This product utilizes the Sausalito blend in conjunction with filters sourced from Intertaba, Italy. Presently, 82 million units have been released. Additional orders of 60 million have been received and production should begin on August 26, 1992.

A factory trial was conducted for Project 41 in Cabarrus with carbon PCC filters supplied by American Filtrona. Production of this new brand for Japan is scheduled to begin in October.

Two blends have been reformulated by the Leaf Department to reduce the strength response of Blend 322 models at 11mg and 8mg tar.

Concerning the Marlboro licensee production by Japan Tobacco, the factory location transfer is on schedule to begin in September. The DIET trials scheduled for September will be delayed until October.

I. **Objective:** Provide support to operations with respect to existing export products in the areas of quality, cost/productivity, capacity and environmental compliance.

A. **Strategy:** Product Optimization - An attempt to consolidate tobacco cut filler OV specifications by determining the need for tropical OV and flavor formulations.

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1. **Results:** Export Product Standardization

The cigarette transport study of tropical and non-tropical formulations has been completed in Singapore and the U.A.E. Quality audit for critical spotting and staining of cigarettes, throughout all phases of transit and warehousing, has yielded no significant differences between tropical and non-tropical formulations for the Singapore cigarettes.

2. **Plans:** Temperature and relative humidity profile data will be utilized for further cross-functional shipment and simulation studies.

3. **Conclusions:** Results from both the Singapore and UAE studies have demonstrated that tropical OV and tropical flavor formulations do not significantly contribute to product integrity or reduce spotting and staining. The recommendation report has been written and approved. An implementation program will be finalized Third Quarter, 1992.

4. **Contributors:** Graff, Tierney, Chambers, QA, QE, IOS.

B. **Strategy:** Filter Optimization - Changes to existing filtration mechanisms for the purpose of reduction of product variability, cost reduction, consolidation of material specifications and productivity improvement.

- Carbon Consolidation to non-impregnated SCCW and PM specification coconut based carbon.
- Qualification of a porous combining wrap for Lark cavity filters.
- Parliament family carbon filter optimization.

1. **Results:**

CARBON CONSOLIDATION

Coconut Based

Multifilter KS, Va. Slims Lts. Japan and Lark Deluxe Milds have all been converted from MF2C carbon to PICA RC328. Danchi consumer testing of Parliament 100mm has shown no significant difference between control MF2C carbon and Calgon supplied PM specification at 20X70 mesh size. POL testing of MF2C and Calgon PM Specification has been initiated for this brand to determine U.S. consumer response to the proposed specification change. POL results have been received indicating no difference between PM specification carbon versus the control Parliament 100's.

Trials will be conducted in September at Stockton Street to ensure no manufacturing problems exist in use of the Calgon PM spec. carbon. If successful, inventory depletion will begin of MF2C carbon.

Coal Based

Coal based SCCW carbon, specified in Lark cavity filters, was being evaluated without iron and zinc impregnation, in order to align specifications for a potential consolidation to one carbon specification, and to achieve an estimated \$800,000 annual cost reduction. Danchi consumer testing has demonstrated no significant difference between control and non-impregnated SCCW carbon. Specifications were issued June, 1992 and depletion of SCCW carbon was completed in July, 1992.

POROUS COMBINING WRAP

Development of a porous combining wrap for cavity filters to replace the current mechanically perforated material has demonstrated that the new materials achieve the desired goals of increased ventilation mean and reduced ventilation variability. Specifications were issued for use of the Kimberly-Clark porous heatseal combining wrap on Lark Mild KS SP for Japan in April, 1992.

The initial production run of three weeks of Lark Milds KS SP was monitored around the clock by R&D, Operations Services and Kimberly-Clark personnel. Production quantities were evaluated analytically and subjectively, met all quality criteria, and were subsequently released for commercial use in Japan.

PARLIAMENT CHARCOAL FILTER MODIFICATIONS

A factory trial was conducted on May 14, 1992 at Stockton Street utilizing a more efficient tow item 2.7/35,000 as a replacement for the current 5.0/35,000. PM specification carbon was incorporated in this test in place of MF2C. The initial brands targeted for this modification were Parliament 83mm FTB (Japan) and Parliament Lights 83mm FTB (Korea), and will also encompass the Parliament 100's brands. The increased efficiency filter for Parliament 83mm FTB did not achieve the desired tar reduction to 8.0mg with conventional 100 watt lasers.

With installation of 250 watt lasers and new inner filter design, the 8mg tar target was achieved. Parliament Lights KS FTB (Japan) was produced at Stockton Street in August, 1992.

2. Plans:

CARBON CONSOLIDATION

Coal Based

Upon depletion of existing SCCW inventory, 100% conversion to PMCC coal based carbon was completed in July, 1992.

Savings realized on this conversion will be determined by PM's commitment to purchase this carbon in the future.

Coconut Based

Inventories of MF2C carbon are being held to a minimum in order for a quick and orderly change to PM specification coconut carbon to be completed by December, 1992.

POROUS COMBINING WRAP

Remaining Lark brands to be converted are Lark Super Lights and all lark 100 packagings. Total conversion to porous heatseal should be complete by December, 1992.

PARLIAMENT CHARCOAL FILTER MODIFICATIONS

Factory trials will be conducted to further expand use of the new inner filter for all Parliament brands.

3. Conclusions:

Carbon Consolidation - After consolidation to one coconut base carbon at PM specification and removal of impregnants from SCCW, further consolidation to one carbon on all cavity and dual acetate filters can be considered. Base material pricing and future availability will be considered in the consolidation efforts.

Porous Combining Wrap - The Kimberly-Clark material has performed exceedingly well in filter and cigarette quality, ventilation variability reduction and mean ventilation augmentation.

Parliament Charcoal Filter Modifications

Recommendations will include the usage of the 2.7/35,000 (FT-777) carbon filter, on all Parliament brands and the 250 watt laser ventilation system on the Lights KS products.

4. Contributors: Lambert, Sealey, Finley, Chambers, Laslie, Manufacturing Services, QA, QE, Engineering, Manufacturing, Environmental Services.

C. Strategy: Tar Delivery Reduction - In response to a decrease in sales weighted tar averages in both the Japanese and Korean markets, several brands are slated for tar reductions.

- Lark Super Lights Japan reduction from 8.0mg to 6.0mg TIOJ tar and remaining Lark Japan brands reduction by 1.0mg TIOJ tar.
- Marlboro KS Korea reduction from 13.5mg to 12.0mg FTC tar and Marlboro Lights KS Korea reduction from 9.0mg to 7.0mg FTC tar.

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- PM Lights Japan reduction from 11.0mg to 10.0mg TIOJ tar and PMSL Japan reduction from 8.0mg to 6.0mg TIOJ tar.

1. Results:

Lark Family Tar Reduction

Lark Super Lights was further reduced to 6.0mg tar in April, 1992 production. By April, 1992, all tar reductions were completed on Lark. Products are scheduled to be in retail by June/July, 1992 and will also include the upgraded graphics.

Marlboro Korea Family Tar Reduction

Results from PMI field testing of Marlboro FF and Lights with charcoal have been received; no product changes are planned at this time. SCP testing is currently in progress. Results will be monitored to ensure that the proper products are in place in the Korean market. Results are expected in early September.

PM Lights Tar Reduction

The tar reduction from 11.0mg to 10.0mg TIOJ tar was completed in April.

PM Super Lights Tar Reduction

A request was made to reduce PM Super Lights tar to 6.0mg TIOJ tar. It has been communicated to Asian management that these reductions will require a filter length increase from 21mm to 27mm to achieve the optimal product.

Trials are currently underway to incorporate AFC as an approved vendor to supplement filter requirements for 108mm filters on PMSL and Merit Lights.

2. Plans:

Lark Family Tar Reduction

Danchi consumer testing is scheduled which will evaluate further tar reductions of the Lark Milds product. Results of this Danchi series of tests will be available late September, 1992.

Marlboro Korea Family Tar Reduction

Additional prototypes will be produced utilizing blend and flavor modifications to reduce the impact of the 12mg Marlboro product. These models will be evaluated on the SCP Panel.

3. Conclusions:

Lark Family Tar Reduction

The reductions in tar of the Lark family are intended to bolster flattened sales trends, especially with respect to Lark Milds, whose major competitors on the market are at 9.0mg and 10.0mg tar. The reduction to 10.0mg, accompanied by an accelerated advertising campaign will be re-evaluated in the third quarter. If sales have not shown positive growth, blend changes, to improve blind product testing among Mild Seven and Mild Seven Lights smokers, or a line extension will be considered.

Marlboro Korea Family Tar Reduction

Consumer testing supports the decision to continue using CA filters for the Korean Marlboro family, rather than converting the dual carbon filters. Additional blend/flavor modifications will be evaluated in order to reduce the impact of the Marlboro FF product.

PM Lights and PM Super Lights Tar Reduction

The PM family is being repositioned via tar reduction, to become more competitive with the growing Kent family in Japan.

These products will undergo a filter length increase.

4. Contributors: Lambert, Sealey, Garrett, Hoskin, Chambers, Manufacturing Services, Purchasing, Production Planning, QA, LMCP, Engineering, QE, Manufacturing.

- D. Strategy: Packaging Revisions - Track changes in packaging of export products, specifically with respect to printed deliveries and the export warning notice program.

1. Results:

Export Warning Notice Program

A random rotation of the four U.S. warning notices will be added to 184 export packagings, which currently do not have local health warnings on the pack. Conversion will occur upon depletion of existing packaging materials to minimize obsolescence. Target completion of change-over is December, 1992. Artwork has been developed for 120 brands, with approximately 30 brands in production presently.

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2. Plans:

Export Warning Notice Program

All export packagings not bearing local or U.S. warning notices will be converted to include a health warning by fourth quarter, 1992.

Printed Tar and Nicotine/Health Warning Legend Notice - Iran

Monitor production start-up tar and nicotine values to ensure that they conform to the printed legend values.

II. Objective: Support growth of international business, short term, through the launch of new commercial products and through support of affiliates and licensees.

A. Strategy: Support of Marlboro licensee production by JT, including monitoring of production transfer from Odawara to Kanazawa.

1. Results: Japan Marlboro Factory Location Change

Representatives from Export Product Development, Leaf Department, Technical Services and PM Asia inspected the primary modifications made to the JT's Kanazawa factory in July, 1992. A factory trial was then conducted and Marlboro Lights KS cigarettes were produced. After observing the primary trial, a few additional modification requirements were identified and agreed upon with JT. The Marlboro Lights KS cigarettes produced during the trial were analytically and subjectively acceptable.

2. Plans: Commercial production is scheduled to begin in the Kanazawa factory at the beginning of October, 1992. The production transfer of Marlboro KS and Marlboro Lights KS will be completed at the beginning of December, 1992. The production transfer of Marlboro 100 FTB is scheduled to be completed at the end of March, 1993. Danchi testing of Marlboro KS and Marlboro Lights KS produced in Kanazawa will begin in the 4th quarter, 1992. Export Product Development and the Leaf Department will provide coverage during the production start-up at Kanazawa.

3. Conclusions: JT's modifications to the Kanazawa factory to date are acceptable and meet PM's standards for Marlboro production in Japan. Additional modifications were discussed with JT and will be inspected during the production start-up at the beginning of October. Production will be monitored to ensure that the current product integrity and consistency is maintained. This will be confirmed via Danchi consumer testing.

4. Contributors: Hickie, Brumberg, Tucker, Parrish, Chambers, JT, PM Asia, PMKK.

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B. Strategy: Marlboro Japan DIET Development Program - Evaluate DIET inclusion in Japan Marlboro family to enhance subjective and analytical performance of the products.

1. **Results:** A blend of Japanese bright tobaccos, expanded in the "D" Building large scale facility, was selected for further trials. This material has been designated JIET 2. An additional large scale blend and prototypes were produced in Semiworks in July, 1992 to fine tune the blend composition and physical parameters for cigarette construction. Noni-tobacco materials specifications for the Odawara factory trials were forwarded to JT in August, 1992. The selected Japanese bright grades were shipped from JT to PM Ltd. in Australia for expansion trials in July, 1992. The expanded product from Australia was evaluated in Richmond. It did not meet analytical and subjective requirements for use in the upcoming factory trial at JT's Odawara factory. Additional tobacco has been ordered from JT so that expansion trials in Australia can be repeated. Leaf Department will provide coverage for this trial and evaluate the product on site.
2. **Plans:** Expansion trials in Australia are scheduled to be repeated the first part of September, 1992. Expanded tobacco from this trial will be shipped to the U.S. and used in blend/prototype production in Semiworks. The factory trial at JT's Odawara factory has been delayed until early to mid October, 1992. Danchi test production will take place at that time. Four prototypes will be produced with the DIET inclusion blend--Marlboro Red KS @ 14.5mg TIOJ tar, Marlboro Red KS @ 13.0mg TIOJ tar, Marlboro Lights KS @ 11.5mg TIOJ tar and Marlboro Lights KS @ 9.0mg TIOJ tar. Analytical and subjective evaluations will be reviewed along with consumer testing data with PM Management in order to make a recommendation regarding DIET inclusion and CPC submission. Tar reductions are planned to coincide with DIET inclusion in the Marlboro blend.
3. **Conclusions:** Danchi testing of the DIET inclusion models will be completed by the end of 1992. Management reviews and recommendations will be completed early in the first quarter, 1993.
4. **Contributors:** Hickie, Brumberg, Parrish, Roberts, Chambers, Semiworks, PM Ltd. Australia, PM Asia, PMKK, JT.

C. Strategy: Pan Asian Menthol - Develop a full flavor and lights menthol family to compete with Salem and Salem Lights in the Asia region.

1. **Results:** Baseline menthol testing has been completed in Japan. The last requested test in Hong Kong will be completed in September, 1992. This test includes three market products and one prototype at 8mg UK tar with Virginia Slims Lights Menthol filler.

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2. **Plans:** Additional testing and product development is will be based on feedback and further product definition from PM Asia.
 3. **Conclusions:** Further work on this program will be based on direction from PM Asia.
 4. **Contributors:** Hickie, Parrish, Matthews, Chambers, Semiworks, Pm Asia.
- D. **Strategy:** New product launches in Japan to foster growth of PMKK and PM Licensee market share, currently over 11%.

1. **Results:**

Project 41

Development efforts have centered around designing a 1.0mg TIOJ tar product with a PCC filter, utilizing a carbon in web core, that will achieve superiority in liking over Frontier Lights among selected low/ultra low delivery smoker groups. Development has also included the evaluation of a PCC filter utilizing a carbon on TELA paper core. Six Danchi tests have been completed with one additional in the field, and another test in transit. Prototype evaluations for the current marketplace product should be completed by mid-October. A decision was made to proceed with the carbon on TELA PCC filter sourced from AFC. A factory trial was conducted in Cabarrus in August.

Blend 322

Develop a mainstream Japanese-type blend which will achieve equivalent liking and strength ratings to JT Marlboro Lights in Danchi consumer testing, among Mild Seven and Mild Seven Lights smokers. This blend is currently being evaluated in 11mg and 8mg products on Danchi panel. Results are expected in September, 1992.

Preliminary consumer results indicate Blend 322 exhibits strength ratings which are not appropriate for target smoker groups.

Two blends have been reformulated by Leaf to reduce the strength response to Blend 322 models at 11mg and 8mg tar.

Ultra Lights Development

Develop a 3.0mg TIOJ tar product using non-conventional, high efficiency carbon filters. Combining the efforts of the Filter Technology Group and outside vendors, a filtration system will be chosen which satisfies both analytical and subjective criteria and is commercially available. Highly flavored blends will also be developed to attract Caster/Caster Mild smokers.

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Lark Ultra

A Lark family line extension is being considered to take part in the rapid growth of the below 6mg tar category in Japan.

2. Plans:

Project 41

Final specifications of the filter purchased from AFC should be completed by September 1, 1992. Brand launch fabrication is scheduled to begin in late October.

Blend 322

Danchi testing of this blend with dual (11.0mg TIOJ) and plug space plug (8.0mg TIOJ) filters will begin in June, 1992.

Ultra Lights Development

Appropriate blends and flavors will be evaluated to determine their suitability for this project. Prototypes will be manufactured using non-conventional, high efficiency filters.

Danchi tests, in Japan, will be scheduled for products considered as potential candidates for this project.

Lark Ultra

Models are being prepared for consumer testing with the intention of having a model recommendation for a product launch during the first quarter 1993.

3. Conclusions:

Project 41

The appropriate web and filter development, as well as consumer testing is in place for commercialization third quarter, 1992 and launch February, 1993.

Blend 322

Due to capacity limitations of rounded corner packaging machinery, this launch has been delayed until later in 1993. Also Danchi tests are being planned to evaluate reformulations of Blend 322 with the goal of reducing strength scores on the 8mg and 11mg models.

Ultra Lights Development

The Merit Ultra Lights introduction is planned for October 1993. The Philip Morris Ultra Lights introduction is planned for October 1994.

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Lark Ultra

Initial plug space plug models have been screened subjectively.

Additional blend and filter combinations will be produced for screening and Danchi model selection.

4. Contributors: Lambert, Keatts, Hickie, Poindexter, Laslie, Finley, Claflin, Pflueger, Chambers, Hoskin, Parrish, Matthews, Newman, Tierney, Sealey, QE, JT, PMKK, PM Asia.

- E. Strategy: New project launches in Asia, EEMA and EEC to increase market share in existing markets and establish sales in markets previously restricted to importation.

1. Results:

Marlboro Lights KS FTB Jumbo Carton for Hong Kong and Singapore Duty Free - Produced in June 1992, launched in July 1992.

Parliament 83mm Regular Charcoal FTB for Colombia - Produced in August 1992, launched in August 1992.

Marlboro Medium 100's FTB for U.S. Duty Free - Produced in June 1992, launched in July 1992.

Marlboro Lights 83mm Menthol Foil FTB for U.S. Duty Free Jumbo Carton - Produced in June 1992, launched in July 1992.

Marlboro Lights 83mm FTB Regular for Singapore Duty Free - Produced in August 1992, launched in August 1992.

Parliament 83mm Regular FTB Charcoal for General Export - Produced in June 1992, launched in July 1992.

Merit Lights KS SP Korea - Smoking evaluations were conducted in Seoul in early May, 1992 to determine the product which was launched in mid-August. Recommendations were generated and the product chosen was the Muratti Ambassador Ultra Mild. This product incorporates a triple component filter and utilizes the Sausalito blend. Twenty-eight million units were couponed with informational leaflets attached. Additional orders of 52 million have been fulfilled. New orders for 60 million have been received and production is scheduled to begin on August 26, 1992.

Virginia Product (Hilda) Taiwan - Consumer testing vs. Long Life Milds and State Express, Second Quarter, 1992, launch in October, 1992. Hilda prototypes with cork and white tipping were produced, overtipped, packaged and sent to Taiwan for testing in late April/early May, 1992.

2. Plans:

Parliament Lights KS FTB Japan - Launch in November, 1992.

Merit 1 KS FTB GCC - Launch in September, 1992.

Marlboro Lights 100 FTB Singapore - Launch in October, 1992.

Marlboro Medium KS SP Hong Kong/Macau - Launch date undetermined.

Merit Lights KS FTB 14's Japan - Launch in August, 1992.

PM KS SP/FTB Lebanon - Launch is contingent upon the success of Winston - no timetable.

Virginia Slims Super Slims 100's FTB Guam - Launch date undetermined.

Merit Ultima 100's Regular SP Guam - Launch date undetermined.

Marlboro Medium KS FTB Hong Kong - Launch date undetermined.

Chesterfield KS FTB Thailand - Launch in July, 1992.

Virginia Slims Menthol 100 FTB Thailand - Launch date undetermined.

B&H Deluxe Lights 100 FTB for Taiwan - Launch in December, 1992.

Marlboro 100 FTB Thailand - Launch in October, 1992.

Marlboro KS FTB Taiwan D.F. - Launch in December, 1992.

Virginia Slims Lights 100's FTB Menthol Taiwan D.F. - Launch in September, 1992.

Marlboro KS FTB Menthol U.S. Duty Free - Launch date undetermined.

Marlboro Medium KS U.S. Duty Free - Launch date undetermined.

Parliament 100's FTB U.S. Duty Free - Launch date undetermined.

B&H KS FTB Russia - Launch in August, 1992.

Marlboro KS FTB (5 Pack Carton) U.S. Duty Free - Launch date undetermined.

Chesterfield KS FTB GCC - Launch is contingent upon the success of Lucky Strike - No timetable.

Chesterfield Lights KS FTB GCC - Launch is contingent upon the success of Lucky Strike Lights - No timetable.

Merit Lights KS SP Korea - Launch in August, 1992.

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Marlboro Lights KS FTB 10's Korea - Launch in December, 1992.

Marlboro KS FTB 10's Korea - Launch in December, 1992.

Virginia Product (Hilda) Taiwan - Launch in October, 1992.

Marlboro Lights KS FTB 10's Singapore (LS to KS Conversion) - Launch in December, 1992.

Marlboro KS FTB 10's Singapore (LS to KS Conversion) - Launch in December, 1992.

3. **Conclusions:** All products will be monitored during production and released upon receipt of analytical and subjective approval. Product specifications will be generated and efforts will be coordinated with the appropriate PMUSA departments, in order that all planned launch dates are realized.
 4. **Contributors:** Graff, Tierney, Easley, Sealey, Lambert, Chambers, Garrett, Hoskin, Production Planning, Purchasing, Manufacturing Services, QA, PM Asia, EEMA, EEC.
- F. **Strategy:** Support of Marlboro licensee production by JT, including monitoring of production transfer from Odawara to Kanazawa.

1. **Results:** Japan Marlboro Factory Location Change

The production transfer plan was reviewed with JT the week of 3/23/92. Primary modifications, cleaning procedures and the transfer timetable were discussed.

2. **Plans:** The Kanazawa factory will be revisited in July, 1992 to ensure that all required modifications (scheduled for 4/25/92 - 6/30/92) are implemented, and an initial primary factory trial, after will also be conducted. Subsequently, factory trials for each Marlboro brand will be conducted in Kanawaza, and the appropriate Danchi consumer testing will occur during the transition, in order to ensure that product consistency is maintained. Upon subjective and analytical approval of factory trial production, initial commercial production, monitored by PM R&D will begin. All products will be evaluated analytically and subjectively.
3. **Conclusions:** All aspects of the factory location change will be monitored to ensure that current product integrity and consistency is maintained and confirmed via Danchi consumer testing.
4. **Contributors:** Hickle, Brumberg, Parrish, Chambers, JT, PM Asia, PMKK.

G. **Strategy:** Marlboro Japan DIET Development Program - Evaluate DIET inclusion in Japan Marlboro family to enhance subjective and analytical performance of these products.

1. **Results:** The DIET development plan was reviewed with PMKK and PM Asia, and negotiated with JT to finalize the program in March, 1992. JT supplied Japanese tobacco grades to Richmond for expansion. Two Japanese bright blends and one Japanese burley grade were expanded in the "D" Building large scale facility on 5/12/92. Four large scale blends were produced in Semiworks on 5/19/92, with prototype production following the weeks of 5/25/92 and 6/1/92.
2. **Plans:** Flavor development will be initiated if warranted. Upon evaluation of initial prototype production, results will be reviewed with PM Management and JT, and Japanese tobacco will be sent to Australia for expansion. Factory trials will be conducted in Odawara with tobacco blends having DIET inclusion, and cigarettes will be produced for Danchi consumer testing. Analytical and subjective evaluations will be reviewed along with consumer testing data with PM Management in order to make a recommendation regarding DIET inclusion and CPC submission. A phase-in plan will also be developed with the Leaf Department, for continued negotiations with JT, regarding DIET inclusion.
3. **Conclusions:** The details involved in evaluating DIET inclusion in Japan Marlboro have been reviewed and agreed upon. The program will be completed by the end of 1992.
4. **Contributors:** Hickie, Brumberg, PMKK, Semiworks, PM Asia.

H. **Strategy:** Export Merit cut filler with reduced alcohol flavors to Egypt.

1. **Results:** Primary specifications factory packet has been written and reviewed with Stockton Street.
2. **Plans:** Run 5,000 lbs. each of control Merit cut filler and Merit cut filler with reduced alcohol flavors. Ship a box of each filler to Egypt, Neuchatel and Richmond Semiworks for cigarette manufacture and subsequent analytical and subjective evaluations.

I. **Strategy:** Pan Asian Menthol - Develop a full flavor and lights menthol family to compete with Salem and Salem Lights in the Asia region.

1. **Results:** Prototype testing of blend, menthol level and tar delivery has been completed in both Hong Kong and Japan. Baseline menthol product testing is continuing in Japan.

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2. **Plans:** Baseline testing of menthol products in Japan will be concluded in July, 1992. Baseline testing is planned for Hong Kong, pending feedback from PM Asia.
 3. **Conclusions:** Optimal designs have been selected for potential launches, if a decision is made for a Pan Asian menthol product launch.
 4. **Contributors:** Hickie, Parrish, Matthews, Hoskin, Chambers, PMKK, PM Asia
- J. **Strategy:** GCC Product Development - Congress Full Flavor (tar 12.0mg./nicotine 0.8mg.) and Congress Lights (tar 7.0-8.0mg./nicotine 0.6mg.) are being developed as a contingency to supply product for the GCC export market. This will compete against the recent RJR introduction of Winchester KS FTB.

1. **Results:** Five existing blends have been identified as potential candidates for this project.
2. **Plans:** Flavor Technology, Leaf, and Export Product Development will evaluate each blend. Prototypes will be manufactured with the approved blends and evaluated for subjective and analytical criteria.
3. **Conclusions:** Optimal designs will be selected as potential launch candidates, if a decision is made to export these products from the U.S.
4. **Contributors:** Tierney, Jackson, Hoskin, Chambers, EEMA, Cook, Heidsieck

I. **Objective:** Examine the tobacco rod density of competitive European cigarette brands.

A. **Strategy:** At the request of FTR, the tobacco rod density of several European cigarette brands from a competitor were examined using neutron radiography.

1. **Results:** The results showed that there were no indication of deliberate, periodic variations in the density of the cigarettes. However, normal density variations present in the tobacco rod from the making process were shown. The results of this work were presented in a memo and at a Directorate staff meeting.

Information on the concentration of nicotine in sidestream and mainstream cigarette smoke was provided to Peter Martin at FTR. Further detailed data was faxed to Peter.

Information on who to contact for peak cigarette coal temperature measurements was provided to Sabina Pestlin at FTR.

2. **Plans:** Further measurements and information will be provided as requested.

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3. Contributors: Chemical Research Division

4. References: D. D. McRae and H. V. Lanzillotti, "Density Variations in Cigarettes," Memo to H. J. Grubbs, May 29, 1992.

D. D. McRae, "Density Variations in Cigarettes," Presentation at the Basic Research Staff Meeting, June 9, 1992.

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**OPERATIONS
SUPPORT**

2023135047

PROGRAM NUMBER : 920102
PROGRAM NAME : Operations Support
PROGRAM COORDINATOR : R. N. Ferguson
WRITTEN BY : R.N. Ferguson
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary:

The number of individual activities within this program necessitate some discussion of each item separately. In general, most areas remain on schedule with respect to operational plans.

- The study of moisture effects on mold growth is on schedule and interesting observations have been made on relationships of water activity and the potential for mold growth on various tobacco types.
- Wet tobacco materials were found to be more resistant to microbial growth than had been expected. An explanation will be sought for the phenomenon.
- No viable alternatives have emerged from evaluation of alternate CB control agents. This could be an important long range challenge for PM domestic and International operations.
- The implementation of new methods for tobacco treatment for phytosanitary certification has achieved a significant milestone, acceptance of a 3-step conditioning cycle at 20th Street.
- A status review of the CPA laboratory has further clarified its role in Operations. Initial objectives will be completed at the end of 1992.
- A major accomplishment has been the growing acceptance of the commercial ELISA kit for Dianex and methoprene determinations in situations where the reference hplc procedure is not readily available.
- An R&D developed method for MH-30 has proven to be a useful alternative to conventional colorimetric procedures in initial studies.
- The analytical groups conducting direct and indirect materials studies were combined. This has broadened the range of techniques readily available to evaluate both classes of materials.
- The first phase of the adhesive program has been completed. Significant analytical problems have been encountered in an attempt to utilize a relatively simple spectroscopic approach to batch to batch differences in adhesives. Discussion will be necessary with Technical Services personnel.
- The number and complexity of customer complaints have greatly increased recently. The time used to deal with such samples has correspondingly increased this quarter.

- International has originated a new activity, requiring analysis of materials used for unauthorized Marlboros collected from around the world. This program needs to be further defined before its possible impact on R&D support is established.

Operational plans have been prepared for this program for 1993. At that time the R&D activities in the area of process monitoring and environmental support will be coordinated by this program.

Area Objective: Provide support to PM Operations for technologies to insure leaf, blend, or reconstituted leaf quality. These include entomology studies, analysis for insect growth regulators or for crop protection agents, the management of moisture on stored tobacco, and specialized analytical support.

I. Objective: To develop methods and to evaluate the microflora in tobacco materials in support of Operations.

A. Strategy: Determine the minimum moisture level in tobacco which will promote visible mold growth.

1. Results:

A second mold/moisture study on burley tobacco was completed. The results showed that burley stems equilibrated to a higher moisture content than the whole leaf or lamina samples. At around 75% RH, mold growth started at the stems in the whole leaf in 55 days. Lamina alone did not show mold growth under the same conditions.

A study of the mold/moisture relationships with MT, No. 6 ORT, RLTC and RCB was completed. For shredded RLTC and RCB, the samples did not show mold growth at the end of 75-day incubation at 25°C when the water activity (Aw) was below 0.72. For shredded MT and No. 6 ORT, the critical Aw was 0.62 or samples below this Aw did not show mold at the end of the 75-day incubation period at 25°C.

2. Plans: Determine the critical moisture level which will promote mold growth in burley stems - 4th Quarter, 1992.

3. Conclusions: Burley stems will equilibrate to higher moisture content than the lamina, therefore, the moisture content in the stems should be used to evaluate the potential of whole leaf to mold.

4. Contributors: J. Jones, D. Teng, N. Thompson

5. Reference:

Thompson, N., PM Notebook No. 8779, pp. 160-166.

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- B. **Strategy:** Evaluate tobacco materials from different cigarette-making processes as requested.

1. **Results:**

Six separate runs of wet tobacco materials (WTM) (>18% OV) and these materials after drying (14.5% OV) from a blend silo prior to cutting and at the cutter "as is" were evaluated for microbial profiles at zero-time and during a 7-day storage period. Samples in runs 1-3 were taken from the processing line while runs 4-6 were from the PM-80 boxes containing the WTMs. No differences have been observed in the microbial profiles between the wet versus the dried materials over the storage period studied.

Five runs of vibrating table stem (VTS) samples were analyzed for microbial profiles. The results showed no significant changes in VTS either before or after wetting; however, some microbial development was observed in the clumped material present in the VTS after storage.

A one year storage study of St. John's bread was completed.

2. **Plans:** Report results to requesters.
3. **Contributors:** D. Chadick, J. Underwood, P. Aument
4. **Reference:**

Chadick, D., PM Notebook No. 9044, pp. 99-106.

- II. **Objective:** Provide entomological technologies to PM Operations for all aspects of cigarettes beetle control.

- A. **Strategy:** Continue to evaluate potential alternatives to methoprene as CB control agents. Develop a better understanding of the interaction of methoprene or other agents with various tobaccos in relation to potential for CB control.

1. **Results:** (a) Both laboratory susceptible and feral CB's emerged from 0-5 ppm Nylar® concentrations. Only feral CB's emerged from 5-10 ppm concentrations. (b) Kinoprene® did not cause insect mortality at low doses (e.g., <100 ppm). Hydroprene® caused significant mortality (>50%) at concentrations between 10-100 ppm in laboratory susceptible CB's. (c) Adults have been detected in all target methoprene concentrations (5, 10, 15 and 20 ppm) of treated stems. Methoprene analysis of the stem having residues of 10 ppm (target was 20 ppm) showed that the pith contained 1.1 ppm while the outer layers contained 3.6 ppm. (d) Bioassay of methoprene unexposed (one

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generation prior), feral CB's to concentrations of 0-80 ppm methoprene showed that no adults emerged from treated tobacco. (e) Laboratory reared CB's appear to have a different binding site alteration for methoprene when compared to feral CB's. Lab CB's were susceptible to methoprene but not to JH III, while ferals were susceptible to neither compound.

2. **Plans:** (a&b) No further work will be conducted with Nylar® or Kinoprene® and appropriate memos will be issued regarding these compounds. Determine mortality of CB's on Hydroprene® concentrations 10- 100 ppm. (c) Repeat the stem experiment using larvae and have methoprene concentrations analyzed by ARD. (d&e) No further work is planned in this area; documentation will be forthcoming on these studies.
3. **Conclusions:** (a&b) Nylar® is effective between 5-10 ppm on feral CB's, while Kinoprene® is effective at greater than 100 ppm and Hydroprene® is effective between 10- 100 ppm. (c) None until the experiment is repeated. (d) If a potential CB resistant/tolerant generation is not exposed to methoprene for one generation, they appear to lose the propensity for methoprene resistance/tolerance. (e) There appears to be a difference in the methoprene binding site(s) between the laboratory and feral CB's.

4. **Contributors:** S. Tenhet, D. Coar

5. **References:**

1. Tenhet, S., PM Notebook No. 9091, p. 63.
2. Coar, D., PM Notebook No. 9012, pp. 50-95.

B. **Strategy:** Phytosanitary Certification of Export Blended Strip.

1. **Results:** Received final approval from the USDA/ARS/PPQ regarding acceptance for a new method of treatment of export blended strip using a 3-step conditioning cycle as a quarantine treatment for the tobaccos processed at the 20th St. Facility.
2. **Plans:** Develop a similar method of treatment at Stockton Street for export cut filler.
3. **Conclusions:** The 3-step conditioning cycle as a quarantine treatment for export blended strip was accepted as a new method.
4. **Contributors:** M. Tickle, D. Faustini

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5. Reference:

Barco, B., Phytosanitary Export Certification CFR 353 (Compliance Agreement), Letter to D. L. Faustini, August 11, 1992.

III. Objective: To provide methodology and measurements of crop protection agents (CPA) as needed to insure that tobacco product components and other materials meet regulatory requirements.

A. Strategy: Establish necessary existing and new methodology in the CPA laboratory.

1. **Results:** Four basic tobacco methods are now in place (FTR Part A, organochlorines, Part B, organochlorines and organophosphorus, and herbicides). FTR organochlorines Part A and Part B were successfully modified. Studies of Part B, organophosphorus and the herbicide method are in progress. TCLP methods are in place and procedure documentation continues. Cooperative SFE and CORESTA studies are underway for aldicarb. NCI for mass spectrometer in place and preliminary sensitivity studies for compounds of interest are underway.
2. **Plans:** Maintain capability for TCLP service as needed. Complete modification of the three FTR methods by 10/01/92. Implement ARD HPLC method for MH-30 by 10/01/92. Provide technical assistance for ELISA and SFE studies and complete the latter by 12/01/92. Establish methodology by 12/31/92 (if available from FTR) for one-half of the eight compounds targeted by the Leaf Department. Develop methodology for qualitative and quantitative confirmation of all FTR CPA's at regulatory limits by 12/31/93.
3. **Conclusions:** FTR methodology improvements are nearing completion. Initial studies continue to indicate that mass spectrometric analysis of CPA levels at the regulatory limit will be possible with most of the FTR targeted compounds. Determination of the remainder may be possible but will require modification of present sample preparation methods and use of NCI methodology. Methods for the determination of the eight additional compounds targeted by the Leaf department will await the development of that methodology by FTR.
4. **Contributors:** R. Davis, W. McCoy, N. Adams, E. Thomas, J. Ware, J. Pierotti, N. Einolf

B. Strategy: Provide documentation of methodology sufficient for transfer where necessary.

1. **Results:** FTR method changes documented in notebooks. TCLP methodology developments documented in notebooks. Methodology for Leaf targeted compounds awaits definition.

2. **Plans:** Complete documentation of revised FTR methods in R&D method form by 12/01/92. Level of documentation for TCLP to be determined. Provide documentation of new methodology in R&D method form within three months after commissioning. Time-line is ongoing.

3. **Contributors:** R. Davis, W. McCoy, N. Adams, W. Ryan, J. Pierotti, C. McNeilly, M. Young

IV. **Objective:** Develop novel, or implement commercially available, Enzyme-linked Immunosorbent Assays (ELISA) for compounds of interest to PM. Transfer the technology and specific ELISA to the appropriate personnel throughout PM.

- A. **Strategy:** Focus major efforts on implementation of commercially available ELISA assays for Dianex and for Aldicarb.

1. **Results:**

A preliminary study was conducted to address several areas of concern regarding the measurement of Dianex (methoprene) residues in the manufacturing environment. The preliminary study involved a collection of tobacco and tobacco dust samples from various locations of the Manufacturing Center's first floor Primary Processing Facility. The samples were collected prior to the application of Dianex and at one week intervals for one month following the application. The amount of Dianex measured in the samples prior to application ranged from 0.4 - 21.4 ppm. Three days following the application the concentrations of Dianex detected in the samples showed an increase in most of the samples and ranged from 0.4 - 19.4 ppm. The results of this study suggested that the treatment does last up to 1 month since the majority of the samples tested contained between 3 and 10 ppm Dianex 24 days after the application.

Tobacco samples containing previously determined concentrations of aldicarb were obtained from PME and analyzed by use of a commercially available aldicarb ELISA. The concentrations of aldicarb detected for each sample were highly comparable to the aldicarb levels previously determined.

During this period PM Latin American personnel were introduced to the use of the commercially available ELISA for methoprene. A workshop comprised of a presentation on theory and a demonstration on the use of the kit was organized for the introduction of the ELISA to this group.

2. **Plans:** Extend the preliminary study to include the collection of replicate samples at the same sample locations of the MC Primary Processing Facility to obtain two and three month data points. Obtain standards of aldicarb and 2,4-D prepared in tobacco extract, and tobacco samples containing 2,4-D from PME to analyze in the ELISA plate kit assays.

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3. **Conclusions:** Certain ELISA assays continue to show areas of potential applicability for Operations needs.

4. **Contributors:** O. Gaines, E. Morrisette, B. Davies, D. Wagner, R. McCuen, D. Faustini

5. **References:**

1. Wagner, D. T., Business Need for ELISA Tube Kit Method for Methoprene, Memo to C. L. Ellis, May 4, 1992

2. Gaines, O., PM Notebook No. 9093, pp. 158-171.

3. Gaines, O. M. Dianex Analyses of Tobacco and Tobacco Dust Samples, Memo to D. T. Wagner, August 6, 1992

4. Morrisette, E., PM Notebook No. 9093, pp. 109-128.

V. **Objective:** Provide specialized Analytical support related to residue analysis on leaf and filler.

A. **Strategy:** Conduct a collaborative study of methods for determination of MH-30, including a new micellar hplc procedure.

1. **Results:** An informal collaborative study between PM-USA and FTR was conducted to evaluate the HPLC procedure (by S. Yang, PM USA) as an alternative method for the determination of MH-30 in tobacco. Seventeen ground tobacco samples provided by FTR were analyzed in labs of PM USA and FTR colorimetric methods: (a) PM USA, HPLC method (Yang, *J. Chromatogr.*, 595, 1992, p. 346) Colorimetric Method (NCSU, North Carolina State University, S.A. Meyer and T. J. Sheets, *Rev. Environ. Contam. Toxicol.*, 98, 1987, p. 43; (b) FTR, HPLC Method (Yang) Colorimetric Method (ISO, International Organization for Standardization, *ISO Method* No. 4867).

2. **Plans:** Communicate the results of this study to those involved with this study.

3. **Conclusions:** The data obtained from this study show that our HPLC method can generate reasonably accurate results consistent with the results from the other established methods.

4. **Contributors:** S. Yang, I. Smetena

Area Objective: Provide technological support to PM Operations by the evaluation or specification of direct and indirect materials.

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I. **Objective:** To determine the chemical compositions of materials used or proposed for use in cigarette manufacturing or found in our products.

A. **Strategy:** Perform appropriate infrared, X-ray, and other analyses in order to determine the chemical composition of the above materials.

1. **Results:** Numerous chemical identifications were made of materials used in the PM manufacturing facilities employing the appropriate analytical procedures. The results and the recommendations were entered into the Materials Evaluation database and reported to Quality Assurance. Materials analyzed included 28 cleaning solutions and the defoamers in them for Cabarrus facility, seals and sealants, belts, o-rings, suction cups, tubings, and other materials.

Cigarette package overwraps were examined by infrared procedures and identified as uncoated polypropylene on eight brands and polyethylene terephthalate on one.

Two separate red customer complaint samples were analyzed and identified as protein type materials by infrared techniques.

Unauthorized Marlboro cigarettes from foreign countries were analyzed to determine the material compositions. Several components of these cigarettes or packages were identified as not used by PM.

2. **Plans:** The activity of the chemical component identification by instrumental methods in support of operation will be continued.

3. **Contributors:** S. Coleman, M. Griff, J. Lyons-Hart, G. Vilcins

II. **Objective:** To provide technological support to PM USA for quality improvement by the evaluation or specification of direct and indirect materials. Provide specialized problem solving support.

A. **Strategy:** Identify the chemical composition of direct materials used in cigarette manufacturing employing several different analytical techniques.

1. **Results:** The analytical work to determine the chemical composition of adhesives used at PM facilities was continued. Numerous adhesives were investigated and the results reported.

The program used to determine the lot-to-lot variability of the adhesives was not providing the desired results. Other chemometric techniques are under investigation for this purpose. FTIR data have been obtained from adhesives of various lots to test the proposed programs.

2. **Plans:** The program to analyze the adhesives and their lot-to-lot variability will be continued. Other analyses will be performed as necessary.

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3. **Contributors:** K. Dudzinski, M. Griff, C. Keene, N. Einolf, G. Vilcins

III. Objective: Develop analytical and sensory specifications for incoming flavors used by PM USA. Transfer specifications and methodology to the Flavor Center and Technical Services.

A. Strategy: Work with Technical Services, Purchasing, QA, and other R&D staff as required to transfer specifications and methods as vendor agreements are obtained. Discuss specifications and methods with vendors to reach agreements on same.

1. **Results:** Numerous specifications packages were assembled, reviewed, and delivered to D. Williams for forwarding to suppliers. Additional samples were requested, received, and analyzed to clarify our preliminary specifications. Several new or replacement flavors were analyzed for specification purposes. Several flavor vendors' concerns have been addressed and others are currently in the negotiation phase.

2. **Plans:** Continue to support Purchasing in obtaining agreements with vendors. Develop additional flavor specifications as required.

3. **Contributors:** K. Sanders, B. Baronian, D. Stagg, N. Einolf, D. Williams

Area Objective: Provide technological support to PM Operations for finished product quality. Investigate customer complaints as requested by Product Audit Facility.

I. Objective: To determine if foreign materials are present and to characterize morphology and elemental content of the same in customer complaint samples.

A. Strategy: Use light microscopy, scanning electron microscopy, and energy dispersive spectroscopy to analyze the samples.

1. **Results:** Eight customer complaints were examined. They included the following:

A pink 'waxy' material was found between the plug wrap and the filter plug. Since no inorganic elements were detected, the material was assumed to be organic, but no identification was made.

A purple stain was located on the filter tip. No elements were detected. No identification was made.

Muscovite mica, generally used for electrical insulation, was found and identified in one cigarette.

A cigarette that the customer claimed to have exploded did not contain evidence of an explosive load but did have several pieces of stem material at the burned region of the cigarette.

Another cigarette that was claimed to have exploded did contain evidence of an explosive load. Small particles of Pb were found on the inside of the cigarette rod wrapper paper.

Two Marlboro Medium FTBs were burned. The burn appeared to have started on the outside of the box. Reasons for this assumption are (a) a fragment of a cigarette lighter 'flint' was found on one of the boxes, (b) the pattern of burn was along a straight line along the slit of the foil side of a FTB, and (c) the cigarettes were burned only on the front side of the cigarettes and only those from the front row.

A cigarette from a Benson and Hedges Deluxe 100s FTB had an orange-brown material on the filter. This material produced a positive response to a stain that identifies peroxidase activity. This stain is a presumptive test for blood.

Four cigarettes from two of three packs of Benson and Hedges cigarettes were examined for unusual material and one cigarette contained one small seed pod.

A presentation was given to the New York Screening Committee for Possible Liability Claims in which the following was discussed: (a) the procedures used by Analytical Microscopy to evaluate customer complaints, (b) procedures used for handling product tampering samples, and (c) examples of the different types of customer complaint samples. A tour of the Analytical Research Divisions labs was provided for the committee.

2. Contributors: L. Thompson, D. Miser, V. Baliga

3. References:

1. Thompson, L., "Evaluation of Customer Complaint #92007," Memo to S. Yang, June 8, 1992.
2. Thompson, L., "Evaluation of Customer Complaint #92023," Memo to S. Yang, June 11, 1992.
3. Miser, D., and Baliga, V., "Customer Complaint 92024," Memo to S. Yang, July 22, 1992.
4. Thompson, L., "Evaluation of Customer Complaint #92029," Memo to S. Yang, July 7, 1992.
5. Thompson, L., "Customer Complaint #92034," Memo to S. Yang, July 29, 1992.
6. Baliga, V., Customer Complaint #92028," Memo to S. Yang, August 19, 1992.

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7. Baliga, V., "Customer Complaint #92038," Memo to S. Yang, July 29, 1992.
8. Baliga, V., "Customer Complaint #30692, #49," Memo to S.S. Yang, April 1, 1992.
9. Thompson, L., "Evaluation of Customer Complaint #92039," Memo to S. Yang, August 12, 1992.

II. **Objective:** To characterize unauthorized cigarette products that were supplied to Richmond R&D from FTR-R&D, Lausanne, and the sales force with the objective of identifying the number of and the source of unauthorized operations.

A. **Strategy:** Characteristics from each of the unauthorized and authorized products to be identified have been defined and the analyses will be divided between R&D-Richmond and R&D-Neuchatel by mutual agreement.

1. **Results:** Eighteen sets of samples of suspected unauthorized products, sold as US export, have been received by R&D-Richmond from Neuchatel for characterization. The samples are being compared to each other as well as to thirty-eight authorized licensee's products. The study has become a joint effort between R&D in Richmond and R&D in Neuchatel. A planning meeting was held in July to identify specific characteristics to be examined and to establish protocol for managing the joint effort. Identification of producers of unauthorized product will be facilitated by the development of a characteristics database. The database will consist of two types of information, factory specific and vendor specific characteristics. Some of the vendor specific characteristics include inorganic and organic compositions of the packaging materials, inks, adhesives, cigarette rod wrapper papers, tipping papers, and plug wrap. Some of the factory specific characteristics include compositions of flavors, humectants, and tobacco types, machine specific defects, and design and make of cigarette and packaging materials. As materials from known suppliers are obtained and analyzed, the results will be added to the database. New pickups of unauthorized product will be compared to the database for identification. If these samples prove to be from unknown operations, their data will be entered into the database and the operation will be located through their materials suppliers.

Protocol is being developed for sample pickup, coding, reporting, and the coordination of efforts between Richmond-R&D, FTR-R&D, Lausanne and the sales force. The analyses to be performed will be divided between Richmond and Europe by mutual agreement. One unauthorized operation has already been located in Titograd, Yugoslavia.

2. **Contributors:** D. Miser, V. Baliga, M. Griff, D. Watson

NEW
EXPANDED TOBACCO

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PROGRAM NUMBER : 920104
PROGRAM NAME : New Expanded Tobacco
PROGRAM COORDINATOR : E. B. Fischer
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary:

Batch NET - A major effort has continued during the past quarter by Leaf and R&D personnel in determining the NET blend, casing, and process expansion temperature conditions to meet product utilization objectives. This work is being directed by New Product Development.

Merit and Benson & Hedges POLs utilizing NET at a 15% inclusion level are scheduled for mail out in October.

Continuous NET - This portion of the program still lags behind the original schedule. A major milestone has been achieved by project personnel with the development of a working model to predict the effects of process variables in a cyclic operation. It is believed that this accomplishment will allow for realizing projected year-end objectives.

I. Objective: Define the Batch Gaseous Impregnation process for Burley and Oriental.

A. Strategy: Define the batch gas process parameters for Burley.

1. **Results:** Five impregnation and expansion tests were made using Burley at 15% OV to test the effect of soak time and impregnation pressure on equilibrium CV/OV.
2. **Plans:** Determine the optimum effect of impregnation pressure and tobacco OV on equilibrium CV/OV.
3. **Conclusions:** A completion date of October 1992 for the process optimization is expected.
4. **Contributors:** C. Moogalian, J. Dobbs, R. Lum, J. Atkinson, V. Covington, Materials Evaluation Lab, Semiworks Primary, G. Romig

B. Strategy: Define the batch gas process parameters for Oriental.

1. **Results:** Five impregnation and expansion tests were made using Oriental at 15% OV to test the effect of soak time and impregnation pressure on equilibrium CV/OV.
2. **Plans:** Determine the optimum effect of impregnation pressure and tobacco OV on equilibrium CV/OV.

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3. **Conclusions:** A completion date of November 1992 for the process optimization is expected.

4. **Contributors:** C. Moogalian, J. Dobbs, R. Lum, J. Atkinson, V. Covington, Materials Evaluation Lab, Semiworks Primary, G. Romig

II. Objective: Optimize the Humid Air Reordering and Precooling Processes for Commercial Scale-up.

A. Strategy: Complete the pilot plant studies on humid air reordering and precooling.

1. **Results:** Additional extensive trials of the fire detection system for the exit tower cooling conveyor were successfully completed. A 99% probability of detection is ensured for tower temperatures of 525°F and above. Fire detection system design criteria were transferred to Engineering.

Initial trials of the precompression system were not fruitful. It appears potential in this area is limited.

Work is continuing on the basic humid air reordering process patent as well as two equipment patents.

2. **Plans:** Perform further tests on the precompression system as time permits.

3. **Conclusions:** Basic pilot plant process studies are complete.

4. **Contributors:** A Kumar, L. Lipscomb, R. Lum, M. Toerne, Materials Evaluation Lab, W. Winterson

III. Objective: Determine a Tower System Design which will Ensure Successful Scale-up of the NET Process.

A. Strategy: Develop a tower feed valve and separator which will provide maximum product expansion, uniformity, and subjective acceptability.

1. **Results:** An evaluation of the cold feed valve showed no difference in product quality when run cold or at ambient conditions.

The short cyclone separator and a modified oversized tangential separator were evaluated on the 8" tower. The short cyclone produced product comparable to the existing tangential but with greater breakage. The oversized tangential provided the cleanest separation of the study, achieving virtual plug flow.

2. **Plans:** Test present close coupled feed valve against standard feed valve by September 1992.

Test separators on the 8" tower at high throughputs by September 1992.

Determine commercial modifications to feed valve and tangential design by October 1992.

Transfer technology to PM Engineering.

3. **Conclusions:** This work should be completed on schedule.

4. **Contributors:** A. Kumar, L. Lipscomb, R. Lum, J. Washington, W. Winterson

B. **Strategy:** Determine the tower design and operating ranges which will ensure successful scale-up of the NET process.

1. **Results:** A series of tower and separator tests were completed on the 8" tower at low and intermediate mass flow rates. The tower and separator were successfully decoupled in this study. The oversized tangential, which achieved plug flow as described above, allowed calculation of separator effects apart from tower effects. The short cyclone has a path length dependent on tower velocity. The regular tangential responds to increased velocity with increased recycle, as reported by others.

These tests show no influence of dilute phase versus concentrated tobacco flow at low mass flow rates, and a minor effect at intermediate rates. Process variable studies show temperature as the overwhelming effect on exit OV, with much lesser effects from gas velocity and mass flow. CV, while primarily dependent on exit OV, is additionally dependent on the temperature, feed rate, and possibly velocity used to achieve a given exit OV. Breakage across the process was less at low gas velocity.

2. **Plans:** Test high mass flow rates and resolve impact of design and process variables on product attributes and tower operability through pilot testing of alternative tower configurations by September 1992.

Design and install a pilot tower to best model proposed commercial unit by October 1992.

Complete technology transfer to PM Engineering.

3. **Conclusions:** This work should be completed on schedule.

4. **Contributors:** S. Barton, A. Kumar, R. Lum, R. Moffitt, E. Moss, W. Winterson

IV. **Objective:** Implement the Gaseous Batch process commercially.

A. **Strategy:** Assist Engineering in the implementation of the Batch NET process.

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1. **Results:** Layouts of the BOZ and Bermuda cooling conveyor and feeding systems were reviewed with Engineering. Locations of smoke and spark detectors for the Bermuda Plant were established.

Final P&ID's for the cold end at the BOZ Plant were reviewed. Recommendations were transferred to Engineering.

2. **Plans:** Continue to interact with Engineering and Operating personnel as plant design continues.
3. **Conclusions:** R&D, Engineering, and Manufacturing personnel continue to operate together as a team with areas that need attention being addressed.
4. **Contributors:** P. Barton, J. Dobbs, J. Tilly, B. Forkins, R. Lum, D. McDowell, M. North, M. Toerne, W. Winterson

B. Strategy: Assist Leaf and R&D Flavor and Product Development personnel in developing new strategies for NET.

1. **Results:** During this quarter Leaf, Flavor Technology, Cigarette Technology, and Process Development selected a three component blend, casing, humectant, and expansion conditions for inclusion in both Merit and Benson & Hedges. The blend consisted of 65% No. 18 Bright, 15% BPT burley, and 20% MT. POL's of cigarettes using these blends are scheduled to be shipped by the end of October.

A laboratory-scale process was developed to extract a flavor concentrate from tobacco to provide improved subjectives for low density cigarettes. The extraction of NBL dust has been shown to be potentially favorable by Flavor Technology in improving the subjective character of cigarette models.

2. **Plans:** Continue expansion of blends of Bright, Burley, and Oriental as requested by Leaf and Product Development.

Continue to work with Chemical Research to develop an extraction process to generate flavors that will improve subjectives of low density, high NET inclusion level cigarettes.

3. **Conclusions:** NET utilization strategies are being directed by New Product Development with the Leaf Group developing the blends, Flavor Technology and Domestic Product Development Group the products, and Process Development providing the NET products and cigarette fabrication as requested.

An extract of NBL dust can increase the tobacco flavor on 100% DIET cigarette models.

Evaluate extracts of other tobacco-containing materials.

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4. **Contributors:** C. Moogalian, J. Dobbs, B. Riggan, B. Peace, B. Taylor, T. Clarke, V. Covington, J. Atkinson, P. Grantham, G. Carter, W. Mokarry, J. Nepomuceno, J. Sherron, G. Romig, G. Inge, Analytical Research, Materials Evaluation Lab, Semiworks Primary and Make Pack Personnel, Chemical Research, Flavor Technology, Rhett Southwick

V. **Objective:** Develop the Short Cycle Impregnation process to produce an expanded tobacco material having equivalent or better physical and subjective attributes as compared to the Batch process.

A. **Strategy:** Develop the Short Cycle Impregnation process to provide uniformly impregnated product.

1. **Results:** During the past quarter the relationships of the process variables which affect tobacco post-vent temperature and uniformity were determined. The understanding of these relationships are important in the design of the short cycle impregnation system because of the small vessel sizes and the relatively short pressurization and depressurization times required. They have primarily been determined by the development of a dynamic, non-isothermal thermodynamic model of the impregnator to predict temperatures of the CO₂ gas and tobacco as a function of time and location. Process variables which this model takes into account are tobacco, bulk density, impregnation pressure, vessel length/diameter, vent time, vent path, superheat in the CO₂, and heat transfer between the distributor plate and the CO₂ gas. The model is designed to operate repetitively in order to determine if cyclic operation will lead to a "snowballing" phenomena of the distributor plate as observed in the existing ball valves or if an acceptable steady state operation is attained.

The results of the model have been confirmed by about 10 pressurization and 30 depressurization experiments performed on the Phase II impregnation system and a 4 liter vessel.

2. **Plans:** The model will be used to select the appropriate impregnation system for the demonstration facility in R&D.
3. **Conclusions:** The project is still behind schedule at this point, but this strategy is expected to be completed by the end of 1992.
4. **Contributors:** D. Leister, J. Dobbs, K. Cho, W. Nichols, T. Nguyen, R. Prasad, F. Beers, J. Nepomuceno, Physical Research

B. **Strategy:** Evaluate process and product performance of the SCI Pilot Plant.

1. **Results:** No activity.
2. **Plans:** The plans continue to be to redirect the development efforts toward design of a commercial prototype.

3. **Conclusions:** The objectives are expected to be completed in the fourth quarter.

C. **Strategy:** Evaluate scale-up feasibility on a commercial size prototype.

1. **Results:** Three alternative impregnation systems are now being considered: modification of the existing ball valves, modification of two ball valves in order to mount on top and bottom of a pipe impregnator, and use of a conventional Scholtz or similar impregnator. Vendor quotations have been requested in order to make a design selection by the end of September.
2. **Plans:** Design a commercial size prototype in the pilot plant for process feasibility testing - October 1992.

Commercial prototype testing - December 1992.

3. **Conclusions:** The objectives are expected to be met.

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**PROJECT
TOMORROW**

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PROGRAM NUMBER : 920105
PROGRAM NAME : Project Tomorrow
PROGRAM COORDINATOR : R. W. Dwyer and K. H. Shafer
WRITTEN BY : R. W. Dwyer
PERIOD COVERED : Third Quarter, 1992.

Coordinator Summary: NIST is in the process of developing both primary and secondary ignition-propensity tests for cigarettes. Philip Morris is cooperating with NIST in developing these tests. We are currently assisting them in a preliminary evaluation and are scheduled to participate in a full round-robin evaluation in the fourth quarter.

The Joint Venture has tested 500 different upholstery fabrics. Each fabric was tested with an experimental cigarette type which NIST had found to have a high ignition propensity. Of the 500, 145 were found to be ignitable in the as-received condition. These fabrics have been rinsed in water in an attempt to reduce their burn-promoter contents, and will be re-tested in the fourth quarter.

We are continuing to examine the influences of test materials, mock-up configurations, and test conditions on ignition testing. We have found that higher fabric basis weights cause more cigarette extinguishments. The fourth CORESTA collaborative study has been planned and is scheduled to be completed in the fourth quarter. In this study, we shall examine the effects of fabric burn-promoter types and levels on ignition propensities.

Cigarette wrappers printed with bands of Avicel have been obtained and tested. We have observed both extinguishments and ignitions within the bands in tests with cigarettes made from these wrappers. The wrappers are wrinkled and have high variations in Avicel loadings for the same target specification. The technology required for consistent application of material to a fixed area of the paper is not currently available. We are working with Kimberly Clark to develop a commercially-feasible product.

Low mass-burn-rate cigarettes and cigarettes with banded wrappers tend to increase the puff counts. Work is continuing with Leaf to find suitable low-density blends for reducing cigarette puff counts.

I. Objective: Evaluate the feasibility of developing scientifically valid and reproducible cigarette ignition-propensity tests which will reflect real-world conditions, and evaluate the technical and commercial feasibility of making cigarettes with reduced ignition propensities with respect to such tests.

A. Strategy I: Evaluate the feasibility of developing tests for cigarette ignition propensities and determine the extent to which cigarette design parameters influence their performance with respect to such tests.

1. Results: NIST is in the process of developing both primary and secondary cigarette ignition-propensity tests. Philip Morris is cooperating with NIST in

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developing these tests, and we, CPSC, and NIST are performing a preliminary protocol evaluation. After the completion of this study, a nine-laboratory round-robin test is planned for the last quarter of this year.

Our research has shown, and it is confirmed by the literature, that cotton fabrics without high levels of burn promoters are not susceptible to ignition by smoldering cigarettes. Whether or not a fabric can sustain smolder initiated by a cigarette depends on the fabric's burn-promoter content. The Joint Venture is performing a fabric screening study on 500 commercially-available upholstery fabrics. Each fabric was tested using an experimental cigarette design which NIST has found to have a high ignition propensity. We found 145 of the 500 fabrics to be ignitable in the as-received condition in this test. Since then, we have had the 145 ignitable fabrics rinsed in cold water. Samples of each fabric, both in the as-received and rinsed conditions, have been submitted for burn-promoter analysis. These fabrics will be re-tested for ignitability in the near future. The 145 ignitable fabrics have been tested further in the as-received condition. Four additional cigarette designs from the TSG study were used. These designs were reported by NIST to have a variety of ignition propensities. Our results show that one-third of the fabrics cannot discriminate among the cigarettes, one-third discriminates in accord with the TSG rankings of ignition propensity, and one-third showed rankings different from those of TSG.

We are examining a number of means for evaluating cigarette ignition propensities. In performing primary testing, the outcomes generally fall into two categories: ignitions and extinguishments, or non-ignitions and extinguishments. If the fabric contains a sufficiently high concentration of burn promoters, the first outcome is observed, i.e., the outcome depends on the fabric. However, the number of extinguishments appears to be affected by properties of both cigarettes and fabrics. We find that the fabric basis weight, the mock-up geometry, the test draft rate, and the test and storage relative humidities all affect the number of extinguishments.

We are examining the effects of cigarette design parameters on secondary extinguishment tests. These tests use filter-paper substrates in an L-shaped configuration. Experiments are in progress to evaluate the influences of tobacco type, rod density, paper permeability, and circumference on extinguishments.

A CORESTA collaborative study has been planned to assess the effects of fabric burn-promoter types and levels on fabric ignitabilities. The materials for this study are in hand and testing will begin this month.

- 2. Conclusions:** Few, if any, clean fabrics can be ignited by smoldering cigarettes. In order to make them ignitable, they must contain high levels of burn promoters. It appears that the only way to devise an ignition test is to use fabrics which contain high levels of burn promoters. Such tests actually measure the extinguishment propensities of cigarettes. The probability of a cigarette extinguishing on a substrate is a function of the fabric used, the draft rate during the test, and the configuration of the mock-up.

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3. Plans:

- Cooperate with NIST and CPSC in developing and evaluating cigarette ignition-propensity tests:
 - Assist NIST and CPSC in a preliminary evaluation of the proposed NIST cigarette ignition-propensity tests. (3Q92)
 - Participate in the round-robin evaluation of the proposed NIST cigarette ignition-propensity tests. (4Q92)
- Measure the ignition propensities of the TSG cigarettes on cotton duck fabrics using our large-scale test protocol. (3Q92)
- Complete the Joint Venture fabric screening study. (4Q92)
- Participate in the CORESTA fourth collaborative study of cigarette ignition-propensity test development. (4Q92)
- Experimentally determine the effects of cigarette design parameters on extinguishments; design parameters include wrapper variables, rod density and circumference, tobacco shred width, and cigarette pressure drop. (1Q93)
- Evaluate the technical feasibility of producing cigarettes with lower ignition-propensities with respect to the NIST test, which is to be developed. (1993)
- Implement the to-be-developed NIST ignition-propensity test and examine for correlations with our in-house tests. (1993)
- Determine the effects of cigarette thermal properties on the NIST test and develop a secondary test, if possible. (1993)

4. Contributors: Analytical Research, Product Development, Tobacco Processing and Fabrication, Cigarette Testing Services.

A. Strategy II: Evaluate the mechanism of cigarette-induced fabric ignitions and develop a computer model of a smoldering cigarette interacting with a substrate.

1. Results: Evolved-gas analyses of smoldering cigarettes have been performed. The results of these studies show good agreement with earlier calorimetry studies in terms of the heats generated during smolder.

IR imaging shows the temperature distribution on fabric surfaces fluctuate cyclically in time when exposed to smoldering cigarettes. We have found that these fluctuations correspond to the alternating char patterns observed on fabrics exposed to smoldering cigarettes. Neutron radiography has been used to determine linear density profiles of individual cigarette rods. These profiles show density variations of similar periodicity to the fabric temperature fluctuations and char patterns. Preliminary testing suggests that higher density regions in the cigarettes may correspond to the regions of higher fabric temperatures. Additional samples are being prepared to further characterize this possibility.

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Studies with banded wrappers show that the banded regions can affect the outcome of ignition tests. Banded cigarettes can extinguish on a fabric substrate; however, ignitions can also occur with banded cigarettes, and the ignitions can occur in the banded regions.

2. **Conclusions:** All of the cigarettes we have examined appear to have about the same heat flux under a given draft rate. Also, the mass burn rate of a cigarette on a non-igniting substrate appears to be quite constant in time. Since the density of the rod can vary, then the linear burn rate of the cigarette varies as it smolders on a substrate. The reduced linear burn rate in the high-density regions of the cigarette may result in a higher surface temperature on the fabric since the exposure time increases. This hypothesis may explain both the alternating char patterns observed and the band-linked ignitions. Further work is planned to test the hypothesis.

3. **Plans:**

- Determine the effects of cigarette-rod density profiles on substrate temperature fluctuations during ignition testing. (4Q92)
- Experimentally determine the influence of band widths and spacings on extinguishment test outcomes. (4Q92)
- Develop a computer model of smoldering cigarettes which accounts for the effects of cigarette design parameters on cigarette heat flux, coal length, and burn rate; correlate predictions with experimental results. (4Q92)
- Develop a computer model of the temperature and oxygen distributions at the surface of fabric/foam substrates; correlate predictions with experimental results. (1Q93)
- Develop a computer model which predicts the probability of extinguishment of a smoldering cigarette on a fabric/foam substrate. (3Q93)
- Exploit the model to determine the influences of cigarette design parameters on extinguishment propensities. (3Q93)
- Use IR, Schlieren, X-ray, and neutron imaging to examine the cigarette and substrate structure during smoldering. (1993)
- Obtain and evaluate the NIST computer model of cigarette ignition propensities. (1993)

4. **Contributors:** Computer Applications Division, Chemical Research.

A. **Strategy III:** Determine the effects of banded wrappers on ignition testing.

1. **Results:**

(a) Wet-end band applications

In-house trials with the moving-orifice device are being conducted to identify important process variables. Experiments have been run to find the effects of

slurry viscosity, paper moisture content, and slurry pressure on Avicel application level and band definition. A technical agreement is being negotiated with Kimberly Clark for the commercial development of this method.

(b) Dry-end band applications

In this concept, bands of cellulosic materials are applied transversely to the dry paper by rotogravure printing techniques. Bobbin quantities of banded papers using three different grades of Avicel were produced by KC. The difference among the samples was the amount of CMC in the Avicel. Cigarettes were made from the papers and are being evaluated. The wrappers with the Avicel showed unacceptable levels of wrinkling. KC is investigating the use of dry felt to the sheet under tension prior to printing to reduce wrinkling and creasing.

2. **Conclusions:** Joint studies with paper vendors are required to assess the commercial viability of both wet and dry-end banded wrapper processes.

3. **Plans:**

- Evaluate cigarettes made from the banded wrappers. (4Q92)
- Evaluate the operational parameters of the moving orifice. (3Q92)
- Attempt to develop banded cigarette paper capabilities at a pilot facility. (on-going)
- Explore improving the properties of Avicel to meet subjective requirements. (4Q92)
- Evaluate the influences of band mass, width, and spacing on ignition tests. (2Q93)
- Evaluate the influences of band mass, width, and spacing on the NIST ignition tests. (3Q93)
- Attempt to develop commercial banded-wrapper technology and capability in conjunction with outside paper manufacturers. (on-going)

4. **Contributors:** Paper Development, Product Development, Engineering.

A. **Strategy IV:** Continue to pursue the design of cigarettes at reduced mass burn rates which demonstrate subjectively acceptable performance properties.

1. **Results:** We are working with Product Development and the Leaf Department to design low-density cigarettes with low mass burn rates. Various designs have been made which have low mass burn rates. Leaf is seeking low-density blends for these designs using both DIET and NET technologies. Product Development is having the samples made, CTSD-tested, and subjectively evaluated. Some candidates have been products which have met our MBR targets; however, all have been found subjectively unacceptable. This effort is continuing.
2. **Conclusions:** A detailed study will be required by the Leaf Department and Flavor Development to determine the feasibility of producing blends which are commercially and subjectively viable.

3. Plans:

- Develop low-density tobacco blends, utilizing DIET and NET tobaccos and small lamina, for selected brands in order to reduce their puff counts. (on-going)
- Fabricate, CTSD test, and subjectively evaluate low-MBR products; optimize subjectives through re-design if possible. (on-going)
- Design, fabricate, and evaluate brand modifications which meet NIST's anticipated IP test if possible. (on-going)

4. Contributors: Product Development, Leaf Department, NET Program, Flavor Development, Tobacco Processing and Fabrication, Cigarette Testing, Process Development.

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PROGRAM NUMBER : 920106
PROGRAM NAME : Paper Technology
PROGRAM COORDINATOR : S. Baldwin
WRITTEN BY : S. Baldwin and G. Bokelman
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary:

Calcium Carbonate Papers - Two papers were developed for the Virginia Slims program: a 53 g/m² and a 42 g/m² paper. Both versions were made by Kimberly-Clark's single-step process on machine #14. The lower basis weight sheet was selected as the subjectively preferred candidate for consumer testing. This sheet contains 32% Multifex MM calcium carbonate, 9% monopotassium phosphate and a small amount (<0.5%) of wet strength aid, and has a permeability of 10 Coresta. This paper was used for all the Virginia Slims Lights consumer tests that are now in the field.

Sidestream visibility reductions achieved with the lower basis weight paper varied with the circumference of the cigarettes. The 100mm, 23.0 circumference versions averaged 51% reduction and the 85mm, 24.8 circumference versions averaged 43% reduction.

Magnesium Carbonate Papers - Several 12-liter scale reactions were conducted to determine the feasibility of producing approximately fifty pounds of the hydromagnesite/brucite composition in CRD using the aqueous non-sol-gel procedure. It was determined that the synthetic effort would take about 3.5 weeks to produce the material (two scientists and two technicians conducting 44 12-liter scale reactions). The equipment and reagents needed to complete this assignment have been ordered. Fifty pounds of material will be produced for paper making at the University of Maine.

Reaction conditions have been defined for the aqueous sol-gel material. Drainage profiles developed were similar to those for Multifex MM calcium carbonate, suggesting that acceptable paper making characteristics have been achieved.

Cigarette Paper Specifications - A one month trial of Kimberly-Clark papers in Bays 1 and 2 at the MC has shown slightly better performance with the K-C papers than that obtained the previous month with Ecusta papers. Every third pallet was sampled for evaluation of porosity, tensile, elongation, and calcium carbonate variation within and between pallets.

Five pallets of paper produced by Paperies de Mauduit at 26% and 30% calcium carbonate targets were evaluated for machinability testing and performance differences in Bay 2. No machining or dusting problems were encountered. Physical and analytical comparisons are in progress.

Wood Pulp Papers - Two mill trials were conducted at Kimberly-Clark's Spotswood mill to produce a 100% eucalyptus hardwood sheet and a 100% Terrace Bay softwood sheet. These two papers will be used to prepare cigarettes for subjective evaluation to determine whether one fiber type shows any subjective benefit over the other.

- I. **Objective:** Develop a proprietary cigarette wrapper which will reduce visible sidestream smoke in a full circumference cigarette by 70%, compared to an appropriate control, while maintaining subjective parity.

- A. **Strategy:** Optimize the single wrap for Virginia Slims Superslims to achieve an average of 70% sidestream visibility reduction and maintain the current tar delivery target.

1. **Results and Conclusions:** Pallet quantities of paper were prepared by the single-step process for machinability testing in Louisville. The paper ran successfully, and the cigarettes were released into production. The tar delivery was similar to cigarettes with paper from the two-step process. Sidestream visibility reduction was more than 70% for the two samples submitted for testing. Aging studies have shown no differences between single-step and two-step paper.

Uniformity studies were also conducted on the paper. Four bobbins representing four different positions on the master roll were tested for permeability, calcium carbonate, and monopotassium levels at 100 M, 1200 M, 2400 M, and 3600 M. The material was found to be within specifications for all three parameters.

Specifications were written for the single-step paper, and the most recent shipment of paper was made to those targets. The new 10-064A paper has the following targets: 53 g/m² basis weight, 9.5 Coresta (10 cm² clamp), 11% monopotassium phosphate (by colorimetric procedure), 31% chalk, and 0.5% (maximum) process aid. The major difference between this paper and the previous two-step 10-062A is the necessary presence of process aid and the definition of process conditions. Two shipments of the new material have been approved for production at this time. The existing paper inventory will be utilized on a "use up and replace" basis.

2. **Plans:** Production cigarettes will be tested initially for visibility reduction as soon as they are available. After the conversion is complete, QA pick-ups will be monitored for sidestream.

3. **Contributors:** Paper Technology (B. Goodman, M. Cruise, S. Tafur), Analytical Research Division (K. Torrence), Tech Services and QE.

- B. **Strategy:** Develop calcium carbonate papers suitable for use with a Virginia Slims Lights type reduced sidestream product.

1. **Results and Conclusions:** Two papers were developed for the Virginia Slims program: a 53 g/m² and a 42 g/m² paper. Both versions were made by Kimberly-Clark's single-step process on machine #14. The lower basis weight sheet was selected as the subjectively preferred candidate for consumer testing. This sheet contains 32% Multiflex MM calcium carbonate, 9% monopotassium phosphate and a small amount (<0.5%) of wet strength aid, and has a

permeability of 10 Coresta. This paper was used for all the Virginia Slims Lights consumer tests that are now in the field. Flavor coatings were also done on large rolls of this paper for added aroma (A-150) and low odor (CR-2978). All papers were used with ESP perforations.

Sidestream visibility reductions achieved with the lower basis weight paper varied with the circumference of the cigarettes. The 100mm, 23.0 circumference versions averaged 51% reduction and the 85mm, 24.8 circumference versions averaged 43% reduction.

2. **Plans:** Evaluate alternate sizing agents and chalk types. Produce papers at the University of Maine to give higher visibility reductions.
 3. **Contributors:** Paper Technology (B. Goodman, S. Tafur), Domestic Product Development (C. Altizer, D. Newman, L. Wettle), Flavor Technology (J. Pflueger, T. Cravotta), Chemical Research Division (J. Paine, K. Podraza), and Analytical Research Division (S. Yang).
- C. **Strategy:** Develop one or more functioning cigarette prototypes which incorporate a magnesite wrapper and have the maximum sidestream reduction that is compatible with acceptable subjectives.

1. **Results and Conclusions:** Cigarette models made in the semiworks with Ecusta mill run binary magnesite papers that had been coated with potassium citrate or potassium succinate solutions gave sidestream visibility reductions that ranged from 53% to 60%. Subjectively, there was no preference for either citrate or succinate, but it was determined that acid addition was detrimental to subjectives for this paper.

Evaluations were completed on new 45 g/m² binary papers from the University of Maine prepared with either natural (Baymag) or synthetic magnesite. These papers were all found to be lower in magnesite content than planned (18% vs. 28%). Cigarettes made with the natural magnesite paper at 6 Coresta and the synthetic magnesite paper at 5 Coresta had comparable reductions in sidestream visibility (53%). Subjective screening of these cigarettes indicated only small differences, with no preference for either natural or synthetic magnesite. Puff count and tar deliveries for cigarette models made with the two natural magnesite papers at 6 and 10 Coresta were comparable, while the sidestream visibility reduction was lower for the higher Coresta paper (47%). Tar delivery for the cigarettes with synthetic magnesite at 5 Coresta was slightly higher.

2. **Plans:** A status report on magnesite will be completed in the third quarter. No further work with magnesite is planned at this time.
3. **Contributors:** Paper Technology (G. Bokelman, S. Tafur, B. Goodman), Chemical Research Division (K. Podraza, J. Fournier), and Flavor Development (J. Pflueger).

D. Strategy: Develop low sidestream papers based on crystalline composites containing hydromagnesite and brucite (i.e., aqueous non-sol-gel process).

1. **Results and Conclusions:** Several 12-liter scale reactions were conducted to determine the feasibility of producing approximately fifty pounds of the hydromagnesite/brucite composition in CRD using the aqueous non-sol-gel procedure (the reaction of magnesium bicarbonate solution with a slurry of magnesium hydroxide at room temperature, followed by heating to 95°C). It was determined that the synthetic effort would take about 3.5 weeks to produce the material (two scientists and two technicians conducting 44 12-Liter scale reactions). The equipment and reagents needed to complete this assignment have been ordered. Fifty pounds of material will be produced for paper making at the University of Maine.

The products from the initial 12-liter scale reactions were similar in particle shape, size, and composition despite slight variations in conditions. Importantly, a study of the drainage behavior proved satisfactory; drainage testing results for three aqueous non-sol-gel samples prepared as above versus a Multiflex MM CaCO_3 control showed essentially no difference.

2. **Plans:** Evaluate the cigarettes produced from the handsheets prepared with the hydromagnesite/brucite compositions. Prepare fifty pounds of the synthetic hydromagnesite/brucite composition within CRD. Prepare machine-made paper at the University of Maine.
3. **Contributors:** Chemical Research Division (J. Fournier, J. Paine, K. Podraza, J. Seeman), Analytical Research Division (K. Torrence, L. Thompson, V. Baliga) and Paper Technology (N. Gautam).

E. Strategy: Develop low sidestream papers based on amorphous forms of magnesium carbonates (i.e., aqueous sol-gel process) using materials which can be scaled-up to produce commercial quantities.

1. **Results and Conclusions:** Smoking results of four cigarette models made with handsheets containing aqueous sol-gel samples of different hydromagnesite to magnesium hydroxide ratios plus Multiflex MM CaCO_3 ranged from 48 to 66% sidestream smoke reduction with SBTs of 7.0 to 8.2 minutes. The ash appearance was acceptable.

Drainage testing results of an aqueous sol-gel sample, consisting of approximately 85% hydromagnesite and 15% $\text{Mg}(\text{OH})_2$, showed essentially no difference from aqueous non-sol-gel samples and a Multiflex MM CaCO_3 control.

The scaleup of the aqueous sol-gel process was conducted in a 12-liter reactor using magnesium hydroxide as the starting material to prepare the magnesium bicarbonate solution. The product filtered well and accounted for 98.9% of the total magnesium initially taken. However, the composition was deficient in

brucite. A repetition is planned, incorporating a calculated increase in the amount of potassium hydroxide to be employed to meet the desired hydromagnesite/brucite ratio of 85/15.

2. **Plans:** Optimize 12-liter reaction conditions. Evaluate the product from this process for sidestream reduction, subjectives and ash quality. Prepare approximately 100 pounds of the synthetic hydromagnesite/magnesium hydroxide composition.
3. **Contributors:** Chemical Research Division (J. Fournier, J. Paine, K. Podraza, J. Seeman), Analytical Research Division (K. Torrence) and Paper Technology (N. Gautam).

F. **Strategy:** Develop low sidestream papers based on calcium carbonate with rhombohedral morphology.

1. **Results and Conclusions:** The matrix study designed to investigate the relationship of different morphologies of calcium carbonates of similar aggregate particle size was completed. The study involved evaluating cigarettes prepared with machine-made cigarette paper produced at the University of Maine using four different calcium carbonates (Albacar 5970, Microna 3, Multifex MM, and Micro-White 25) as filler. The papers involved were targeted at 47.5 g/m² basis weight, 33% filler level, and 10 Coresta in porosity. The sizing agents chosen were dipotassium succinate or monopotassium phosphate, each at levels of application of 3, 6, or 9% and combinations of these (3% - 6%, and 6% - 3%, respectively). Similar combinations of monopotassium phosphate and potassium citrate, and 9% potassium citrate alone, were studied. The general trend was that the ground calcium carbonates (rhombohedral faces), Microna 3 and Micro-White 25, tended to outperform Albacar PCC (scalenohedral morphology).

Based on the matrix study, fourteen models were selected for fabrication of machine-made cigarettes. The resulting cigarettes will be evaluated for sidestream smoke reduction using the eight-port monitor and subjectively evaluated.

2. **Plans:** Prepare machine-made cigarettes based on the selected models and evaluate for sidestream reduction and subjectives.
3. **Contributors:** Chemical Research Division (J. Fournier, J. Paine, K. Podraza, J. Seeman, B. Edwards), Analytical Research Division (K. Torrence) and Paper Technology (N. Gautam, G. Bokelman).

G. **Strategy:** Utilize the sidestream chamber to fully characterize the analytical chemistry of sidestream smoke from appropriate prototypes.

1. **Results and Conclusions:** Twenty runs with IM13 cigarettes were made on the 8-port prototype Coresta smoking machine. The MS TPM, SS TPM and puff

count data from the 8-port were compared to the long term results for the 5-port prototype Coresta smoking machine. Based on the results of these runs, the 5-port machine has been retired and all future work will be performed on the 8-port machine.

A memo describing the calibration system for the CO and CO₂ monitors on the 8-port prototype Coresta machine has been issued. In addition, the CO and CO₂ sampling systems were modified to permit easier adjustment of the sampling flows and continuous monitoring of the flow rates.

Cigarettes from several low sidestream series have been smoked in the neutron radiographic facility at the University of Virginia. The buildup of water and other condensible materials behind the coal and the mass burn rates were measured. These data are being analyzed.

The filler in IM13 cigarettes was blown out and Westpoint tobacco rods were inserted into the empty tubes. These cigarettes were smoked on the prototype Coresta smoking machine to determine MS and SS TPM deliveries. This work is in preparation for a study at the University of Virginia to measure the transfer of inorganic material from cigarette wrappers.

2. **Plans:** Chamber runs for a series of cigarettes with the same low sidestream wrapper and blend but with different circumferences are being arranged. IM13 cigarette paper tubes will be activated and smoked at the University of Virginia to measure the transference of inorganic materials from the paper to mainstream and sidestream smoke. Banded paper will be analyzed by NAA for iodine.
3. **Contributors:** Chemical Research Division (D. McRae, D. Douglas, K. Tatum) and Computer Applications Division (J. Blankinship).

II. **Objective:** Initiate studies to assess feasibility of reducing the levels of those chemical classes in sidestream smoke which are most likely to contribute to irritation.

A. **Strategy:** Identify probable chemical and perceptual causes of sidestream irritation.

1. **Results and Conclusions:** Several reactor systems were assembled and evaluated as part of an effort to study the effects of acceptable inorganic fillers on the thermal and/or "catalytic" cracking of known classes of irritants in sidestream smoke. The reactors were evaluated using a test reaction for the hydrogenation of carbon monoxide over an iron catalyst. The expected reaction products were observed for each set of reaction conditions. Based on the results, modifications to the reactor design are being made to improve the system.

Literature data indicate that acrolein is a suspected irritant and will be one of the initial compounds studied.

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2. **Plans:** Complete the construction of the reactor to allow investigation of the catalytic activity of selected components. Evaluate low sidestream fillers, novel inorganics, fluxing agents, and interaction products of these with each other for catalytic activity.
 3. **Contributor:** Chemical Research Division (J. Fournier).
- B. **Strategy:** Develop analytical methodology in order to determine compositional differences between selected test cigarettes and controls and to relate these differences, if possible, to known irritants or classes of irritants.
1. **Results:** Improvements were made to the headspace gc/ms system and other gc systems for the analysis of sidestream smoke. Information was obtained on possible irritants in sidestream smoke.
 2. **Plans:** The headspace gc/ms method will be developed into a routine technique.
 3. **Contributors:** Chemical Research Division (D. McRae, D. Douglas, J. Paine).
- III. **Objective:** Determine those cigarette paper parameters which most affect cigarette performance and manufacturing processes and set meaningful specifications and tolerances for cigarette papers.
- A. **Strategy:** Evaluate the effects of paper properties on cigarette performance attributes (puff count, tar, static burn time, etc.) in order to determine whether tolerances on paper specifications are appropriate for Marlboro or other full flavor cigarettes, including determination of paper uniformity requirements for the product.
1. **Results:** Currently the chalk specification for standard grades of cigarette paper is 30.5%, with an acceptable range of 24.0% to 37.0%. These values represent the average of ten samples obtained at random from the pallet; there is no specification for an acceptable amount of variation. A reasonable limit on individual chalk measurements would help ensure minimal variation in tar delivery of cigarettes.

The use of a standard deviation requirement to minimize variation could still result in individual measurements at the extremes within an acceptable average. An alternative is to specify a range for individual measurements in addition to a range for the pallet average. Results of the response surface study indicate that paper with chalk levels from 25% to 36% will result in tar deliveries within 0.7 mg of target for Marlboro KS cigarettes. Specifying a range of 25% to 36% for individual measurements and a range of 27% to 33% for the pallet average should be an acceptable method for minimizing chalk variation.

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Analysis of cigarettes made in the Manufacturing Center showed about a 0.5 mg reduction in tar delivery for cigarettes made with 30% chalk compared to control cigarettes made with 26% chalk paper. Those pallets of paper at 26% and 30% chalk had been prepared by Paperies de Mauduit.

2. **Conclusions:** Proposed pallet uniformity specifications have been recommended. The expected effect of chalk content on tar delivery was verified with factory-made cigarettes.
 3. **Plans:** Complete machinability trials of 30% chalk paper. Evaluate the effect of chalk content on tar variation. Evaluate the effect of chalk content on tar delivery of additional full flavor brands. Test extreme paper parameters on high speed equipment. Determine the variation of key parameters in cigarette paper currently supplied to Philip Morris.
 4. **Contributors:** Paper Technology (S. Baldwin, B. Floyd)
- B. **Strategy:** Evaluate the effects of paper properties on cigarette performance attributes (puff count, tar, static burn time, etc.) in order to determine whether tolerances on paper specifications are appropriate for low delivery cigarettes.
1. **Results:** Production and delivery analysis of cigarettes made to Marlboro Lights KS and Marlboro Ultra Lights KS specifications are complete. Statistical analysis to generate a prediction model is in progress.
 2. **Plans:** Make cigarette models to test the prediction model for light and ultra light cigarettes. Evaluate the effect of parameter changes on delivery of additional light and ultra light brands.
 3. **Contributors:** Paper Technology (S. Baldwin, B. Floyd) and Applied Statistics (M. Ferro, J. Tindall)
- C. **Strategy:** Continue studies to evaluate the feasibility of consolidating the seven papers currently being used (excluding Superslimes) to two or three papers.
1. **Results and Conclusions:** Kimberly-Clark is currently the only qualified supplier of 10-058A, a 28 g/m² paper containing 36% calcium carbonate. A Merit Ultima 100 model made at Cabarrus with an Ecusta version of the 28 g/m² paper gave equivalent analytical and subjective smoking performance to the production control cigarette. Thirty bobbins of the Ecusta paper have been received for a machinability assessment at Cabarrus in September.

A procedure for determining the calcium content of conventional cigarette papers was developed for the R&D X-ray fluorescence instrument. This procedure has been installed on QA's X-ray instrument where test results will be monitored relative to R&D values to validate the method for testing incoming materials.

2. **Plans:** Reassess the cost impact of consolidating the three elevated citrate grades to 10-058A.

3. **Contributors:** W. Geiszler and K. Torrence.

IV. Objective: Evaluate the feasibility of replacing flax papers with wood pulp papers for full margin brands and develop the appropriate papers.

- A. Strategy:** Conduct analytical and subjective evaluations of wood and flax pulps and papers.

1. **Results and Conclusions:** Analyses were conducted on a number of commercial hardwood and softwood pulps for comparison with flax pulps from Ecusta and Kimberly-Clark. Polysaccharide analyses demonstrated that flax pulps have a higher glucose content than either hardwood or softwood pulps. The xylose contents of the pulps were 8-9% for the softwoods, 10-12% for flax, and 18-20% for hardwoods. The insoluble lignin and organic extractives were higher for the hardwoods than for the softwoods or flax.

A series of flax pulps, wood pulps, and papers were analyzed by the infrared technique of evolved gas analysis (EGA) performed under pyrolysis or controlled combustion conditions. Comparison of the evolved gas profiles for flax, softwood, and hardwood pulps also revealed differences between the flax pulp and the two wood pulps, primarily with regard to transition temperatures, with wood pulps giving lower transition temperatures. However, controlled combustion experiments performed on flax and wood pulp papers exhibited very similar gas profiles.

Samples of papers made from wood and flax pulp were submitted for analysis by pyrolysis gc/ms. This request has presented a number of challenges that are being addressed by the development of new methods for pyrolysis, product collection and analysis.

Descriptive panel evaluations were conducted for Marlboro KS prototypes made with the wood and flax papers currently supplied by Kimberly-Clark. The model with wood pulp paper was described as dirty, astringent, bitter, and mouth-coating relative to the flax model. The wood paper contains an 80/20 hardwood/softwood blend. A mill trial was conducted at K-C to produce sheets with 100% hardwood and 100% softwood as the fiber component for further subjective screening.

2. **Plans:** Conduct pyrolysis and evolved gas analyses for wood and flax papers. Conduct subjective evaluation of hardwood and softwood sheets versus flax paper.
3. **Contributors:** W. Geiszler, J. Lyons-Hart and J. Pflueger.

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- B. **Strategy:** Determine the relationships between wood pulp paper properties such as porosity, citrate level, calcium carbonate content, and basis weight and the analytical smoking performance of cigarettes.
1. **Results and Conclusions:** Analytical smoking comparisons were obtained for Marlboro KS and Marlboro Lights 100 models made with wood and flax papers at four different permeabilities. For the full-flavor models, the flax papers yielded a 0.8 mg higher FTC tar delivery than the wood papers. For the 100 mm Lights models, no difference in FTC tar delivery was obtained between flax and wood papers. The sensitivity of FTC tar delivery to paper porosity was the same for wood paper as for flax paper.
 2. **Plans:** Use the current cigarette design model for either wood or flax papers.
 3. **Contributor:** W. Geiszler.
- V. **Objective:** Develop a proprietary filter web for selective filtration, such as of basic or acidic components found in the cigarette aerosol.
- A. **Strategy:** Determine availability and conduct evaluation of appropriate commercial materials.
1. **Background:** In the past it has been shown that changes in subjectives can be effected by adding acids to CA filters or using charcoal filters in which the charcoal has been treated with basic or acidic solutions.
 2. **Plans:** Commercial product literature will be examined and one-pound samples of a variety of novel fibers (such as cellulose-amine derivatives, cellulose phosphate, fibrous CMC, chitosan, and acid-treated Avicel) will be ordered for evaluation.
 3. **Contributors:** Paper Technology (G. Bokelman and N. Gautam).

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2023135084

PROGRAM NUMBER : 920107
PROGRAM NAME : Filter Technology
PROGRAM COORDINATOR : K. A. Newman
WRITTEN BY : K. Newman, R. Rogers, D. Laslie, J. Ryder, J. Hearn,
G. Patron, A. Finley, N. Gautam
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary: A mill run of uncreped PM web with ST90 fiber finish was conducted at James River Gouverneur in May. Merit 3mg and De-Nic prototypes are currently being evaluated with a dual PM web/ca filter construction. Also, paper core concentric dual filters were made and evaluated using 100% Terrace Bay cellulose web produced by James River's Gouverneur mill. Analytical results on cigarettes made with these filters compared favorably to the control. A trial run of PM web was conducted at the University of Maine. The trial run was successful in terms of web formation, roll quality and machine runnability. A plan has been developed to produce additional web materials at the University of Maine incorporating CA fibrils, cotton and eucalyptus fibers, and Aquasorb. Additionally, based on positive analytical results for cigarettes using 100% Tencel filters, additional quantities of Tencel web have been obtained from DuPont. Meet with DuPont and Courtaulds Fibers, Ltd. to investigate the feasibility of increasing the fiber fibrillation and other properties of the Tencel web in order to increase the filter efficiency. In terms of unique uses of webs, samples of Tela paper were coated with concentrated extract liquor (CEL) and were converted into PC-DDF filters at American Filtrona for evaluation as an extension of Merit Ultima technology to enhance subjectives. Also, samples of PM web (75/25 cellulose acetate/cellulose) were laminated with high surface area meltblown polypropylene electret web at Hollingsworth & Vose to increase filtration efficiency. Filters were produced with the modified web, and they are being tested. Finally, the KDF-11 corrugator successfully underwent an electrical upgrade to improve operation, reliability, and safety. Samples of PM web were sent to Baumgartner, S.A. and Intertaba for machinability trials. A confidentiality agreement was completed with Decoufle to evaluate rod qualities of filters produced with PM web on the Decoufle web filter process.

Hardness versus time measurements were done using Estrobond-B, Celanese natural TA, and Unichema natural TA plasticized filters. A measurable difference in hardness was observed when comparing the 8% level to the 6% level. The data suggested different hardness per unit plasticizer for the test materials Estrobond-B showed the largest increase in hardness per unit PZ and Unichema showed the smallest increase. Hardness versus time measurements will be replicated.

Puff by puff CO/CO₂ smoking equipment is now in working order. The contract with Seton Hall University will continue until December 31, 1992. Catalysts with improved shelf life and higher room temperature activity have reduced CO concentrations in a standard test gas. Evolved gas analyses by mass spectroscopy was used to follow the concentration changes. Seton Hall University will give a program update in September and will train PM personnel in catalyst synthesis techniques.

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A joint development agreement was approved by Hoeschst/Celanese and PM to develop meltspun polymeric filter materials for selective filtration. Suggested polymers were screened and fiber development was initiated.

- I. **Objective:** Develop web cigarette filtration system(s) which offer the consumer perceived benefits when incorporated into new cigarette systems.

- A. **Strategy:** Develop a non-woven wet-laid sheet of cellulose acetate and/or cellulosic fibers.

1. **Results:** A mill run of uncreped PM web with ST90 fiber finish was conducted at James River Gouverneur in May. Some filter quality problems associated with web stiffness were observed during rodmaking trials of this material. Merit 3mg and De-Nic prototypes are currently being evaluated with a dual PM web/CA filter construction.
2. **Plans:** Perform analytical and subjective cigarette testing to determine PM web performance and preference against paper/CA dual and cellulose acetate tow mono filters on Merit reduced tar models.

- B. **Strategy:** Develop a domestic source of 100% wood pulp filter web which qualifies as an alternate material to Tela paper in the production of Merit Ultima filters.

1. **Results:** Paper Core Concentric dual filters were made and evaluated using 100% Terrace Bay cellulose web produced by James River's Gouverneur mill. Analytical results on cigarettes made with these filters compared favorably to the control.
2. **Plans:** Replicate analytical and subjective testing relative to the control web material.

- C. **Strategy:** Develop a non-woven dry-laid filter web of Tencel solvent-spun cellulose fibers.

1. **Results:** A trial run of PM web was conducted at the University of Maine. The objective was to determine the feasibility of producing non-creped filter webs (synthetic fiber containing webs) on the pilot paper machine. The trial run was successful in terms of web formation, roll quality and machine runnability. The filter-making attributes of this web are currently being determined. A plan has been developed to produce additional web materials at the University of Maine incorporating CA fibrils, cotton and eucalyptus fibers, and Aquasorb. Handsheet work has been initiated to optimize the papermaking properties of these materials prior to pilot trials.

Based on positive analytical results for cigarettes using 100% Tencel filters, additional quantities of Tencel web have been obtained from DuPont. Detailed discussions were then held with Courtaulds Fibers, Ltd. on improving Tencel

web and on the concept of Tencel in tow form. It was decided to actively pursue development of filters made from Tencel web and therefore a confidentiality agreement is being negotiated with DuPont.

2. **Plans:** Produce pilot quantities of web materials at the University of Maine incorporating CA fibrils, cotton and eucalyptus fibers, and Aquasorb.

Produce an improved cigarette model with a 100% Tencel filter. Complete confidentiality agreement with DuPont. Meet with DuPont and Courtaulds Fibers, Ltd. to investigate the feasibility of increasing the fiber fibrillation and other properties of the Tencel web in order to increase the filter efficiency.

3. **Conclusions:** Tencel web can be used to produce filters with acceptable end appearance and filter efficiencies which are better than standard cellulose acetate filters.

4. **Contributors:** B. Edwards, D. Laslie, N. Gautam

- D. **Strategy:** Develop additives and additive application systems to modify the filtration and/or subjective performance of various web filter media.

1. **Results:** A 12-in wide coater was completed and installed in the Filter Development Lab. Samples of Tela paper were coated with concentrated extract liquor (CEL) and were converted into PC-DDF filters at American Filtrona for evaluation as an extension of Merit Ultima technology to enhance subjectives.

2. **Plans:** Characterize CEL-coated filter models to identify and exploit potential benefits.

3. **Contributors:** J. Ryder, J. Hearn, D. Laslie

- E. **Strategy:** Develop manufacturing processes and operations to produce filters from new filter media.

1. **Results:** The KDF-1 corrugator successfully underwent an electrical upgrade to improve operation, reliability, and safety.

Samples of PM web were sent to Baumgartner, S.A. and Intertaba for machinability trials. Filters were requested for evaluation in a PM web/CA dual configuration.

A confidentiality agreement was completed with Decoufle to evaluate rod qualities of filters produced with PM web on the Decoufle web filter process.

2. **Plans:** Evaluate various web filter constructions from commercial processes on low tar/high taste prototypes.

3. Contributors: G. Patron, K. Newman, D. Laslie

II. Objective: Investigate acceptable alternative cellulose acetate plasticizers to replace triacetin and investigate natural-based glycerine type triacetin as a replacement.

A. Strategy: Use triethyl citrate (TEC) as an alternative CA plasticizer for programs that can make use of the unique properties observed with TEC plasticized filters.

1. Results: Several programs are interested in the possibility of using TEC to reduce harshness and strength ratings recorded for prototype cigarette models.

2. Plans: Support product development programs on an on-going basis.

3. Contributor: A. Finley

B. Strategy: Investigate natural-based glycerine type triacetin (TA) as an alternative to the triacetin currently used.

1. Results: Hardness versus time measurements were done using Estrobond-B, Celanese natural TA, and Unichema natural TA plasticized filters. Filters were made using FT-107 and FT-555 tow at 8% and 6% PZ levels. A measurable difference in hardness was observed when comparing the 8% level to the 6% level. The data suggested different hardness per unit plasticizer for the test materials. Estrobond-B showed the largest increase in hardness per unit PZ and Unichema showed the smallest increase. Subjective analyses were done by Flavor Technology personnel on Marlboro cigarette models with 6% PZ in the filter. The results are currently being prepared.

2. Plans: Hardness versus time measurements will be replicated. FT-666 tow will also be analyzed and the plug maker machine speeds, filter dry weights, and filter RTD will be held constant for each tow item.

3. Contributors: R. Hale, K. Lam, A. Finley, K. Deane

III. Objective: Develop a catalyst for CO removal. Demonstrate CO catalyst feasibility for removing at least 25% of the CO in cigarette smoke. Optimize the method(s) of incorporating the resulting catalyst(s) into conventional or novel cigarette filters.

A. Strategy: Test CO removal catalysts supplied by Seton Hall University.

1. Results: The puff by puff CO/CO₂ smoking equipment is now in working order. The contract with Seton Hall University will continue until December 31, 1992. Catalysts with improved shelf life and higher room temperature activity have reduced CO concentrations in a standard test gas. Evolved gas analyses by mass spectroscopy was used to follow the concentration changes.

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2. **Plans:** Test promising catalysts using standard test gas method and using puff by puff analyses of cigarettes. Seton Hall University will give a program update in September and will train PM personnel in catalyst synthesis techniques.

3. **Contributors:** D. Kellogg, A. Finley

IV. **Objective:** Design, evaluate and develop new filter concepts that provide improved subjective benefits to our consumers.

A. **Strategy:** Conduct joint development of heterofil filter materials with Celanese.

1. **Results:** A joint development agreement was approved by Hoeschst/Celanese and PM to develop meltspun polymeric filter materials for selective filtration. Suggested polymers were screened and fiber development was initiated.

2. **Plans:** Obtain hand-made filters using heterofil fibers. Evaluate analytical and physical performance.

3. **Contributors:** P. Gauvin, K. Newman

B. **Strategy:** Evaluate novel materials and filters from vendors/commercial manufacturers.

1. **Results:** Samples of PM web (75/25 cellulose acetate/cellulose) were laminated with high surface area meltblown polypropylene electret web at Hollingsworth & Vose to increase filtration efficiency. Filters were produced with the modified web and are being tested.

Viscofill Consolidated Corporation (VCC), a European concern, is currently developing and marketing systems for the manufacture of CA tow in 2,000-20,000 tpa volumes at customer's site. A pilot plant is currently being constructed and sample product has been requested. If the VCC claims are proven, this tow production concept could offer significant improvements in cost and availability of CA tow in certain worldwide markets.

2. **Plans:** Measure filtration performance of meltblown/PM web samples to determine whether additional development is indicated.

Analyze samples of VCC products (flake, tow). Conduct applications analysis to determine possible benefits of a VCC system.

3. **Contributors:** D. Laslie, K. Newman

V. **Objective:** Develop a method for producing a Parliament filter which can be manufactured without laser perforating on the tipper.

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- A. **Strategy:** Investigate combining hollow tubes with conventional filter segments enabling the use of pre-perforated tipping paper.
1. **Results:** A vortex tube was used to blow chilled air on the combiner plug hopper knife. This enabled the combining of polypropylene and CA tubes to form Parliament mouthpieces. Both tubes creased as they started through the garniture. Garniture modifications will be necessary to eliminate the crease.
 2. **Plans:** PM Engineering has had considerable success with pin perforated Parliament plugs. In light of this success and the difficulties in combining plastic tubes and the foreseen difficulties in combining to obtain a 5mm segment, this approach to this project will be suspended.
 3. **Contributors:** J. Hearn, J. Ryder
- B. **Strategy:** Explore utilizing uniformly pre-perforated mouthpiece paper with pre-perforated tipping paper.
1. **Results:** A bobbin of Parliament mouthpiece paper has been uniformly perforated on a laser perforator. Inner components for Parliament 100's with porous plug wrap have been manufactured in Semiworks.
 2. **Plans:** Arrangements are currently being made to have Stockton Street produce filter rods plugs using the perforated paper.
 3. **Contributors:** J. Hearn, J. Ryder

2023135090

**CAST
LEAF**

2023135091

PROGRAM NUMBER : 920108
PROGRAM NAME : Cast Leaf
PROGRAM COORDINATOR : G. Gellatly
WRITTEN BY : G. Gellatly; R. G. Uhl
PERIOD COVERED : Third Quarter, 1992

Coordinator Summary: Pilot plant RCB was judged by the Cast Leaf Panel to be very similar to production RCB in 24% blends. Final assessment will be made with 7% substitution in a Marlboro blend.

NBL trials were run in the BL Plant. The slurry aging time of the second trial was raised to 3 hrs from 1 hr to achieve subjective response. Although pectin release occurs in an hour, 3 hrs aging is necessary for the development of flavor precursors. A BL Plant trial was also run with one third less ammonia in the formulation which reduced plant ammonia emission by one third. The subjective response of this reduced ammonia was not the same as RCB and pilot plant trials are planned with modified formulations to reduce this subjective difference.

The pilot plant operation continues to improve. An analysis of the reverse roll coater operating variables was made which improved NBL quality. Moisture meters installed after both dryers have been an asset in maintaining product specification.

The NBL process will be included in the blending area retrofit of the BL Plant scheduled to be completed by mid 1994. This will increase the plant throughput from 6600 lbs/hr to 8600 lbs/hr. Pilot plant grinder trials will determine the grinder size for this modification. The drying conditions during the BL Plant trials agreed well with the dryer model predictions. This model predicts that the existing dryer capacity is capable of drying the higher production rate when the NBL process is installed.

The development of Cast Leaf continues. Progress was made in increasing the drying rate of this product by increasing the humectant and sugar content. This minimizes slurry separation in the dryer which reduces the evaporation rate by forming a skin of gum on the surface of the slurry. Tobacco pectin release is being explored by agents other than DAP for reduced burn rate of the tobacco. The release of binder agents from tobacco by steam pressure treatment is also being pursued.

A business plan for the utilization of European byproducts in CL is being developed. The two alternatives being pursued is sourcing from the BL Plant or the installation of a European Cast Leaf facility if USA production capacity is exceeded.

The LTR test sheet (RLTC-type) was incorporated in the Pan-European Marlboro at 1.8% of the blend.

- I. **Objective:** Optimize the current RCB process for improved sheet physical properties, production capacity, and environmental goals.
 - A. **Strategy:** Utilize the Cast Leaf Pilot Plant to develop new technology applicable to the present RCB process to improve sheet quality without changing the subjective character or delivery.

1. **Results:** Pilot plant BL in a Marlboro blend at 24% (total Recon Substitution) was judged by the Cast Leaf smoking panel to be very similar subjectively to production RCB. Two candidates (BL 164 and 165) were selected for further evaluation at 7% in a Marlboro blend.

Pilot plant NBL was judged to have some subjective off notes. The source of the subjective off taste was traced to the feedstock ground last year in Nuway Tobacco Co. Fresh feedstock ground at Nuway in June and the same feedstock components ground in the pilot plant were considered to be satisfactory for future subjective trials. The processing conditions for NBL using these feedstocks were determined to have very similar subjective response to RCB.

The operation of the reverse roll coater was demonstrated to be one of the main process factors affecting sheet quality with sheet quality improved using a coater setup that maximizes shear. The more finely ground tobacco of the NBL process allows utilization of tighter roller gaps which increases shear. Increased rubber roll speed was also found to be an important variable to increase sheet quality.

A recommendation was made for the purchase of the Moisture Systems Microquad 8000 with sensors to be installed at the entrance and exit of the C-dryer. The recommendation was made after a thorough evaluation of several different technologies. The Microquad sensors have been installed, and a coarse calibration has been performed using both GC water and OV as the reference methods.

2. **Plans:**

1. Complete subjective evaluation of pilot plant NBL for RCB substitution.
2. Continue process and equipment definition for a commercial plant design.
3. Evaluate the filling power of NBL in 100% recon cigarettes and 24% recon in the MF blend (total recon replacement).
4. Complete performance evaluation (subjective, physicals, cigarette yield) of NBL at increased sheet weight to establish feasibility of this strategy for increasing BL Plant capacity.

3. **Conclusions:**

1. NBL can be made subjectively similar and physically superior to production RCB.
2. NBL sheet strength can be optimized within subjective variable constraints for implementation at the BL Plant.

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4. **Contributors:** Reconstituted Tobacco Development, Chemical Research, Analytical Research, Physical Research, Flavor Technology, and BL Plant
 5. **References:** Parrish, M. and Hicks-White, G., "Recommendation for Purchase of Microquad 8000 Moisture Monitor for the Cast Leaf Process," memo to G. Gellatly, May 26, 1992.

McFadden, M. "NBL Factory Trial Results," memo to T. Holland, August 8, 1992.
- B. **Strategy:** Define the potential formulation reductions of ammonia in the NBL process while maintaining the physical quality improvements of NBL and subjective parity with RCB.
1. **Results:** Although the physical and chemical attributes of NBL with 33% ammonia reduction in the binder formulation are similar to normal formula NBL, subjective differences exist between the 100% recon cigarettes. This may be caused by the lower pH of the slurry retarding the development of smoke flavor precursors during aging or drying.
 2. **Plans:**
 1. Compensate for reduced ammonia in the binder formulation through addition of potassium hydroxide or carbonate to maintain slurry pH to achieve subjective parity.
 2. Define formulations which will reduce plant ammonia emission as well as increase the burn rate of NBL.
 3. **Conclusions:**
 1. Formulation and process conditions must be modified to achieve subjective parity of reduced ammonia NBL and RCB.
 4. **Contributors:** Reconstituted Tobacco Development, Chemical Research, and Flavor Technology
- C. **Strategy:** Develop a recommendation for retrofit of the BL plant to a NBL process.
1. **Results:** NBL will be included in the blending area modification of the BL Plant scheduled to be completed by July 1994. PM Engineering has been advised of the scope and process equipment modifications necessary for NBL to increase the production throughput to 8600 lbs/hr (present 6600 lbs/hr). This will meet projected RCB capacity on a 5 day week.

Pilot plant trials have determined the size of grinders necessary to prepare finely ground feedstock (95% < 120 mesh) for this increased throughput of the BL

Plant. The existing grinder will be satisfactory to grind unwashed burley stems at the required three shift operation throughput (2400 lbs/hr) with additional hammermilling. A new Giant Williams Grinder will be necessary to prepare the production dust (4900 lbs/hr for three shift operation.)

The slurry make up system may require a new ribbon blender and slurry transfer pumps.

Two NBL trials were run in the BL Plant in June and August at increased belt speed of 360 fpm (normal 330 fpm). The sheet formation in the June trial was not typical of pilot plant NBL or a previous trial run conducted at the BL Plant in 1991. The cause of this poor sheet formation was thought to be either a soft experimental rubber roll nearing the end of its life or higher slurry solids than specified (22% instead of 21%). In the second trial in August both problems were corrected and the reverse roll coater operation was modified to increase the shear applied to the slurry. Dryer data was collected during the trials which established agreement with the computer dryer model. The model projects the existing dryer has the capacity to dry 12 gm/ft² sheet at 390 fpm belt speed made from NBL slurry at 21% solids content which satisfies projected capacity requirements.

The subjective character of the NBL sheet from the June trial was different from standard RCB. This was attributed to the reduced aging time of one hour. In the August trial closer subjective response of NBL to RCB was obtained by increasing the aging time to the standard 3 hrs. NBL from the August trial was made at RCB substitution level (7%) and total recon substitution level (24%) for subjective evaluation.

A reduced ammonia (33%) trial was also run in June. Plant ammonia emissions were reduced by 32%. Subjective differences were found to exist between this sheet and normal RCB. Laboratories and pilot plant NBL trials will be run to improve the subjective parity of reduced ammonia NBL and RCB.

2. Plans:

1. Run a BL Plant trial in September for POL evaluation of NBL with modified process conditions if PM evaluation of the August trial product is unsatisfactory.
2. Complete scoping checklist for engineering based on optimum processing conditions for NBL. The target date for implementation of NBL in the BL Plant is June 1994.
3. Continue the collection of data that will help validate the dryer model and contribute to a better understanding of the operation of BL and NBL processes.

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3. Conclusions:

1. The dryer model predicts from BL Plant trials at 360 fpm that sufficient drying capacity exists to dry at an increased belt speed of 390 fpm with slurry solids increased from 18.5% to 21%.

4. Contributors: Reconstituted Tobacco Development, BL Plant, PM-USA Engineering, Physical Research, and Flavor Technology

II. Objective: Develop a Cast Leaf process that will provide flexibility in meeting world wide capacity needs for individual reconstituted tobacco types.

A. Strategy: Develop a business plan analysis for a Cast Leaf plant in Europe.

1. Results: A summary of the potential economic and strategic benefits that Cast Leaf offers International was presented to M. Bourlas, Vice-President of International Operations Services. The same presentation was subsequently given to PM USA Leaf Department Management.

The Cast Leaf process provides the opportunity to convert excess feedstocks (estimated 10 MM pounds of Europe) into a usable sheet material that could be used to offset strip purchases. Two economically viable alternatives were reviewed which included (1) sourcing Cast Leaf from the BL Plant, utilizing the excess capacity generated through retrofit to NBL, and (2) installation of a European Cast Leaf Facility.

M. Bourlas held follow-up discussions with PME Management to facilitate a decision on whether to continue Cast Leaf Development for Europe. As an outcome of these discussions, it has been agreed that PME representatives will come to Richmond in October to address specific questions relating to feedstock availability, sheet utilization scenarios and recon product performance issues. These discussions will also examine the potential for a Cast Leaf role in EEMA Region, in light of the recent acquisitions in Hungary and Czechoslovakia, and the potential for an acquisition in Poland.

2. Plans:

1. Meet with PME representatives in October to resolve feedstock questions, address product issues and develop sheet utilization scenarios for consideration by EEC and EEMA.
2. Meet with PME Management to present situation analyses on selected sheet utilization scenarios as requested.

3. Conclusions:

1. A Cast Leaf facility would provide an outlet for any factory byproducts, burley stems or other OTM types that are not being fully utilized.
2. Cast Leaf product offers more flexibility (feedstocks, binders, flavoring systems) in adjusting to changing product needs.
3. Cast Leaf satisfies a strategic need in EEC and offers EEMA a means of consolidating recon types.

4. Contributors: Reconstituted Tobacco Development, Tobacco Processing Department, PM-USA Leaf Department, PME Leaf Department, and PME R&D

B. Strategy: Develop a Cast Leaf product with the burn characteristics of RL.

1. Results: Trials were run to increase the physical quality of guar sheet beyond RCB and improve its drying rate.

Hydration of the tobacco feedstock before the addition of guar gum was evaluated. Cast Leaf product was made with 6, 8, and 10 parts of guar with pre-hydrated tobacco. The resulting sheet showed no improvement in tensile strength over normal processing.

The key to uniform sheet formation and drying rate may be reducing the separation of the binder from the slurry on the belt which then forms a skin on the surface of the sheet which then reduces the evaporation rate of water from the sheet. Increased sugar and humectant content of the sheet was demonstrated to reduce binder separation resulting in an increased drying rate of guar gum Cast Leaf equal that of RCB. These products are being evaluated by Physical Research who will recommend a dryer profile to increase this drying rate further.

Tobacco pectin release by means other than DAP, which reduces burn rate, is being explored. Several chemicals have been demonstrated to release tobacco pectin but slurries using them have not formed satisfactory sheets in the laboratory. Oxalic acid has been the most promising of these DAP alternatives and pilot plant trials will be run for its evaluation.

Steam pressure treatment of tobacco is known to produce products which will form sheet products. The treatment of production dust with pressurized steam (40- 50 psi) for 15 minutes in the presence of 10 parts sodium citrate yielded slurries that possessed some self adhesive properties. These slurries required the addition of about 4 parts guar gum to produce well formed and physically acceptable hand cast sheets. Subjectively, the steam treatment did not appear to alter the smoke characteristics of the production dust. Chemical Research is continuing their investigations with these samples to determine whether the treatments released any tobacco pectin.

2. Plans:

1. Evaluate guar, other binders and co-binder systems to improve sheet quality and drying rate.
2. Investigate dryer settings and RH control to increase Cast Leaf drying rate.
3. Evaluate organic pectin release agents to overcome the burn rate and ammonia emission characteristics of the DAP and ammonia system for pectin release.
4. Determine steam pressure conditions to prepare tobacco for sheet making without product off taste in the laboratory and plan to produce product in quantity for a pilot plant trial.

3. Conclusions:

1. The drying rate of guar gum sheets can be improved by stabilizing the slurry on the drying belt using increase humectants, sugars or CMC.
2. Satisfactory sheet can be made using oxalic acid to replace DAP to increase burn rate.

4. Contributors: Reconstituted Tobacco Development, Flavor Technology, and Chemical Research.

C. Strategy: Support PME Leaf in qualification of LTR for production of RLTC type sheet.

1. **Results:** The LTR test sheet (RLTC-type) selected from the December test series was incorporated at a 1.8% blend level (replacing part of the RLTC) in factory made Pan-European Marlboros (Bergen-Op-Zoom) and German Marlboros (Berlin). Subjective evaluation by PME Panel "A" showed the test sheet to be fully acceptable at this blend level. This new LTR sheet (designated LTR-003) is also intended to replace older LTR types used in PME local brands.

2. Plans:

1. Assist PME in resolving LTR processing questions and in establishing a solubles specification for future LTR production as requested.

3. Conclusions:

1. Qualification of the LTR-003 sheet concludes PM-USA direct involvement and this item will no longer be reported. Liason and support will be provided as requested by PME.

4. Contributors: Reconstituted Tobacco Development, Flavor Technology, Analytical Research Division, Park 500, PME Leaf Department, and PME R&D

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